A Study on BIM-Enabled Commissioning process - from the point of view of functional performance testing

BIM を応用したコミッショニング過程に関する研究

－　機能試験の視点から

劉　暢

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Abstract

Energy Performance Gap (EPG) between the predicted and actual consumption has caused a significant problem for building maintenance. As for the magnitude of the EPG, a general spectrum presents by CarbonBuzz database indicating that buildings consume between 1.5 and 2.5 times predicted values, and the ratio is respectively 1.90 and 1.71 for education and office buildings. Functional Performance Test (FPT) of Commissioning (Cx), which is an experimental process that could effectively understand the operating state of the system, recently is highly anticipated in terms of suppression the disparity between the predicted energy consumption in the design stage of buildings and the energy use during operation. But, due to the need to extract the necessary information from numerous drawings, documents, sheets, and other design data, lead to high workload, labor costs, and information bias, hindering the spread of Cx.

BIM (Building Information Modeling) as a new building information management technology is considered could improve the data usage efficiency by including various related information of buildings in a single model. Such us the efficiency of Cx is possible to be enhanced by entering relevant parameters at the time of early BIM model making phase and directly exported to the corresponding simulation models for pre-assembly performance checking, or the effect verification after parameter adjustment. Thereby it is expected that reducing the workload of the model re-construction and solving the distortion of information transmission due to information island. However, although BIM has been increasingly adopted into the production process, recent applications mainly use a 3D model without non-geometric information for animation or coordination. The processes which lead to the simulation of various environmental

parameters still need to be modeled from scratch, and the information sharing and delivery benefits expected by BIM are not fully utilized. Research on the expressibility and transferability of HVAC system simulation required parameters in BIM is still insufficient.

Based on the above background, the purpose of this study is to explore the techniques and the feasibility of integrating BIM into the Cx-FPT process from the application of HVAC system information, and summarize the limitations and barriers.

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Introduction

1.1. Background

1.1.1. Building energy performance gap

According to International Energy Agency (IEA), the buildings and buildings construction sectors combined are responsible for 36% of global final energy consumption and nearly 40% of total direct and indirect CO2 emissions [1]. Finding solutions for energy saving has become one of the most demanding issues facing almost all the governments, decision makers and stakeholders all over the world. However, a general spectrum presents by CarbonBuzz database indicating that buildings consume between 1.5 and 2.5 times predicted values, and the ratio is respectively 1.90 and 1.71 for education and office buildings [2].

Table- 1 The discrepancy between predicted and actual building energy performance (CarbonBuzz, 2013)

Category	Mean Design Total Heat Consumption (kWh/m^2/yr)	Mean Actual Total Heat Consumption (kWh/m^2/yr)	Factor Change Design to Actual - 'Performance Gap'	Mean Design Total Electricity Use (kWh/m^2/yr)	Mean Actual Total Electricity Use (kWh/m^2/yr)	Factor Change Design to Actual - 'Performance Gap'
Office	46	73	1.59	71	121	1.71
Education	57	84	1.48	56	106	1.90

Such discrepancy is often referred to as ‘building energy performance gap’, which has attracted special attention from the government, industry, and academia. And the Energy performance gap (EPG) has been perceived to be a significant issue of the building maintenance.

1.1.2. Commissioning & functional performance testing

In order to solve the EPG problem, the need to grasp the actual operation of the HVAC system of the building is imminent. As a continuous building energy

management process, Commissioning (Cx) process is expected to optimize energy performance in buildings. Through effective Cx process, the energy waste could reduce up to 20% [3]. To realize the functions and performance of building equipment system that required by the owner, which are summarized in the planning and design requirements document, from the viewpoint of environment, energy and ease of use, the Function Performance Testing (FPT) is positioned as an important implementation item for the commissioning process. In japan, With the several practical studies, the effectiveness of FPT has been confirmed by several practical studies, the feasible implementation methods have been summarized and discussed [4~9] . And the manual of Cx [10] and FPT [11] were published.

The existing Cx research basically analyzes the system operation data obtained through actual measurement, or the BEMS data to find out where the system is not suitable for operation, and proposes improvement suggestions [12, 13]. There are also some studies, after modifying the system according to the recommendations, the modified system operation state is analyzed by the above method, and compared with the original data, then obtain the improvement results [14, 15]. For the effect verification process of the proposal, if through adjust the actual system parameter and collect the data for effect analysis, it will take a lot of time and effort to adjust the system settings, and subject to various limitations of real conditions. So as the Cx manual mentioned, it is better to use simulation for effect checking. It could shorten the work time and improve the quality of Cx.

However, to build the simulation model, a large number of necessary information need to extract from numerous drawings, documents, sheets, and other design data. It leads to high workload, labor costs. Furthermore, in the process of information extraction and transmission, it is prone to bias and loss of information due to the

information island. The present situation and design data collection are usually not an easy task for Cx team [16]. The spread of Cx-FPT was hindered by above problems.

1.1.3. Building information modeling

BIM's advantages in information storage and sharing make it possible to effectively avoid Information Island and promote the formation of Common Data Environment (CDE). The productivity was improved by applying BIM in design, construction, simulation, FM and other processes have been well reported. It is expected BIM could reduce the workload and solving the distortion of information transmission.

It has been strongly aware, and adopted worldwide [17], and have shown an increasingly popular trend in recent years [18~20]. Standards and instruction manuals published by various countries and industry organizations are also constantly improving the application of BIM. Such us the Level of Development Specification that published by BIMForm [21], the Unified Standard for Building Information Modeling in China [22], or the BIM guide line in Japan [23]. To moving the construction industry to 'full' collaborative working, forerunner countries have already developed BIM development strategy, e.g. the BIM Level in Government Construction Strategic published by UK [24].

Table- 2. Respondents aware of and currently using BIM in BIM international survey (for Denmark which is the highest is 78%, and Japan is 46%)

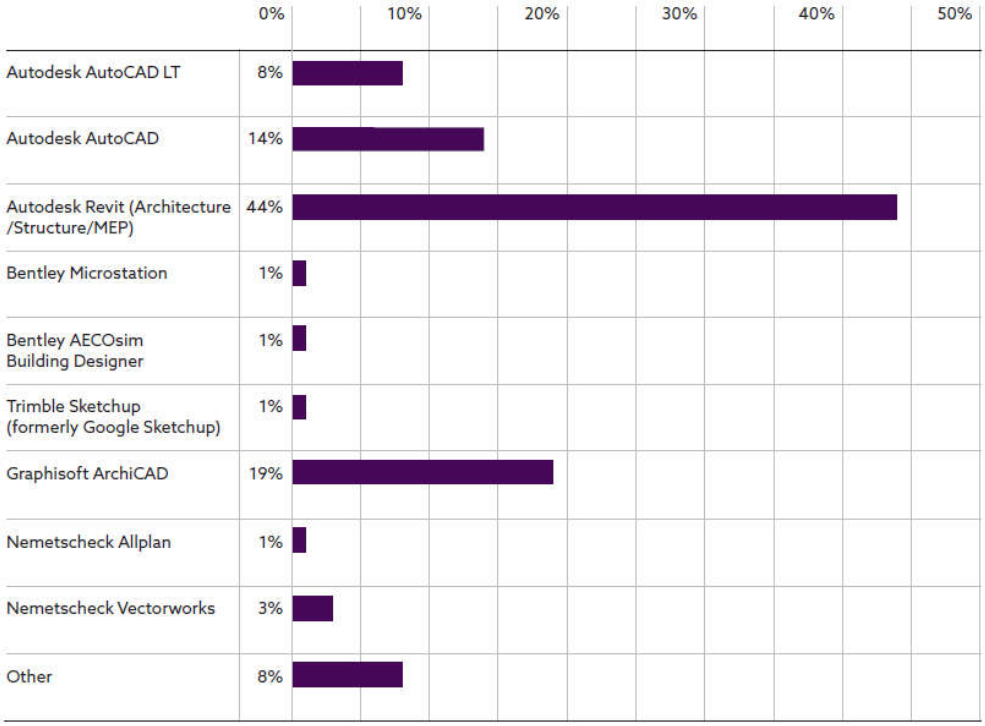
If we can take advantage of BIM in information storage, store the necessary information scattered in the past in a single model, a single information source could be formed, and it is expected to avoid the distortion of information transmission process. In addition, if the advantages of information sharing could be effectively utilized, the information in the model could directly export to data management or simulation software, which can reduce the time and workload of re-modeling as mentioned in relevant researches [25,26].

However, due to the lack of parameter-rich components, the inconsistency of basic settings e.g. line type, layer, interaction mode and delivery form, the develop of BIM-based building construction process is delaying [27]. recent BIM applications mainly without non-geometric information, e.g. coordination or animation, few studies and investigations have been conducted on using BIM in HVAC system parameters, the expected benefits are not fully utilized. More studies are required.

1.1.4. BIM Tools

While BIM is about working in new, collaborative ways, rather than just about buying a set of tools, templates or resources. But tools are still needed. The last NBS BIM survey shows Revit remains the most popular tool with 44% usage.

Table- 3. BIM tools usage in BIM survey 2018 (Revit with 44% remains the most popular BIM software, followed by ArchiCAD)



As a professional BIM software which is widely used in design and construction, and free for students and researchers, currently, there are a lot of architects and researchers that are using Revit, especially for international projects. In this study, Revit 2019 student version was selected as the model builder.

1.2. Research Aim & Objectives

1.2.1. Research aim

The research aim of this study is to explore the techniques and the feasibility of integrating BIM into the Cx-FPT process, and to introduce the limitations and barriers to popularize it. It should facilitate the development of simulation-based optimal operation mode validation. Therefore, the Cx-FPT could thus be better popularized due to the optimization of production mode.

1.2.2. Research objectives

The achievement of the above aim can be accomplished by attaining the following objectives:

- To identify the benefits of Cx, barriers to universalization, and feasible improvement solutions through reviewing previous empirical studies;
- To determine the actual air conditioning system operation states and the thermal comfort of the target building which is located near Tokyo station through conducting survey and BEMS data analyze;
- To identify the expressibility of the FPT relevant parameters in BIM model, and summary the entry method and considerations by practical study;
- To investigate the derivability of related components and parameters between BIM mode and Excel/gbXML/IDF format, and summary the export settings and matters through case study;
- To develop a BIM-based FPT information transmission process base on previous findings, and to examine its efficacy and usefulness.

1.3. Contributions and Significances

This study provides a solid foundation for the integration of BIM and Cx. It is expected to help the spreading of Cx so as to achieve the development of low energy buildings which improves energy conservation and environment protection. This study provides information for reducing the difficulty of BIM-based Cx-FPT implementation and promoting the popularization by presenting an innovative practical application framework.

1.4. The Framework of Thesis

This thesis consists of five chapters. Chapter 1 is an overall introduction. It delineates the research background, hypothesis, and research aim. It also highlights the significance of the research and the structure of the thesis.

In Chapter 2, the methods of this study are elaborated to specify the survey and case studies. The overview of survey building, measurement methods and period, and questionnaire was explained. The settings and methods of two case studies were clearly stated.

Chapter 3 showing the results of measurement, questionnaire, and case studies. The energy consumption of target area also summarized as figures by the data come from BEMS.

In Chapter 4, the BIM-based FPT information transmission process was summarized as a parameter entry sheet. The efficacy and limitations were discussed by the examination.

In Chapter 5, conclusions of this thesis are presented. It starts with the conclusion of the research findings. Then the contributions of this research are collectively presented in its methodological and practical implications. The limitations and suggestions for future work are given at the end.

Chapter 2. Method

2.1. Lecture Review

In Chapter 1, the expected effects for Cx-FPT on reduce the EPG, and the reason that hindering the spread of Cx-FPT were studied. The production efficiency of Cx will be improved by BIM's advantage in information sharing in prospect was defined. The insufficient of studies and investigations on using BIM in HVAC system parameters was summarized. The BIM tools were reviewed.

2.2. Survey & Questionnaire

2.2.1. Survey overview

By applying to the building operator, we were given a chance to investigate the actual performance for Indoor Environment Quality (IEQ) and the occupant sensation of a newly built building that around Tokyo station during the period from 09/26 to 10/12, 2018. Table-4 shows the overview of target building and survey region.

Table- 4. Target building overview

Name	J building
Location	Around Tokyo station
Building type	Office
Total stories	32 floors, 3B
Total area	13,658.91m2
Typical floor	area= 5200m2, height= 4350 mm
Target region	Part of 16FL; 837m2
Business time	9:15 – 18:30
AC Temp setpoint	25℃
Measurement period	2018/09/26 - 10/12 (workday)

2.2.2. Survey schedule

The survey period and daily schedules are showing in Table-5 and Table-6 as below.

Table- 5. Survey period and schedule

	9/26	9/27	9/28	10/1	10/2	10/3
	Wed	Thur	Fri	Mon	Tues	Wed
Survey	**Install**					
Questionnaire						
	10/4	10/5	10/9	10/10	10/11	10/12
	Thur	Fri	Tues	Wed	Thur	Fri
						Withdraw

Table- 6. Daily survey schedule

	0~8:00	9:00	10:00	11:00	12~14:00
Auto meas					
Manual meas					
Questionnaire		**Before**			

15:00	16~17:00	18:00	19~24:00
		Leave	

2.2.3. Measurement method

The survey region the southeast part of 16 floor, which is one of a typical floor as showing as Figure-1. Figure-2 shows the setting locations of measurement points.

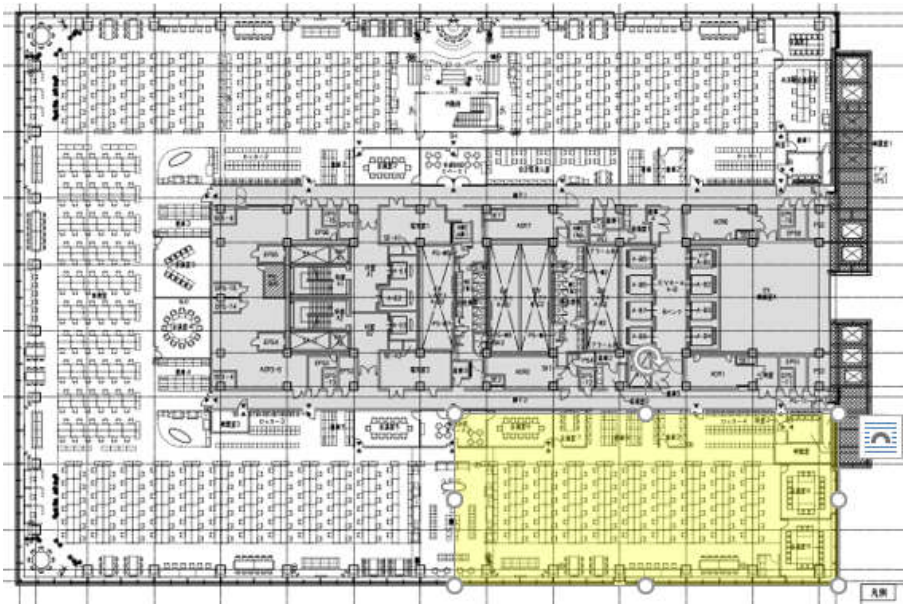
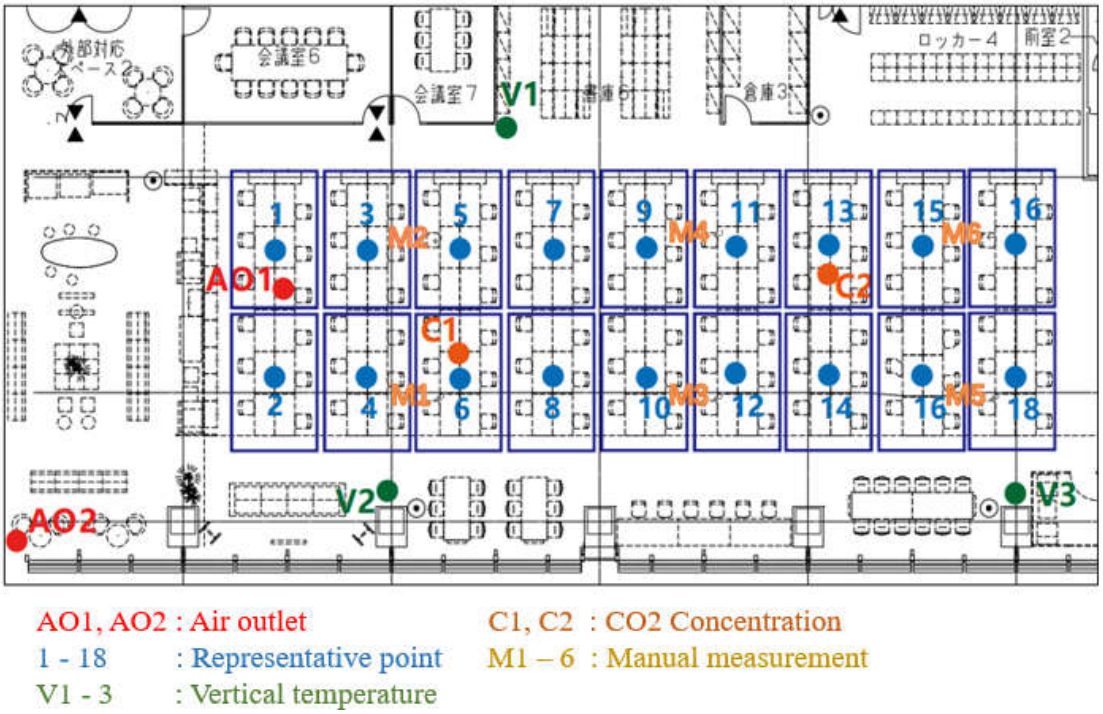


Figure- 1. Overview of survey region



AO1, AO2 : Air outlet
1 - 18 : Representative point
V1 - 3 : Vertical temperature
C1, C2 : CO2 Concentration
M1 – 6 : Manual measurement

Figure- 2. Measurement points setting position

The measured variables are showing in Table-7. In this study, the temperature of the air outlet and representative point were analyzed. The CO2 concentration was used to calculate the infiltration of target building.

Table- 7. Overview of measured variables

	Variables	Height[mm]
Air outlet	**Air temp** RH	Around outlet
Representative point	**Air temp** RH Globe temp	1100
Vertical distribution	Air temp	100,600,1100,1600,2100
CO2	**Concentration**	On desktop
Manual Measurement	Air temp RH Globe temp Wind speed	1000

Air outlet

T&D TR-74 was used for measuring wind outlet temperature and humidity at 2 air supply point. The time series data of temperature and humidity of wind outlets in this office could be collected by automatic measuring.

Figure- 3. Air outlet temperature and humidity

Representative point

At each representative point of 18, T&D TR-74 was set to measure the air temperature and relative humidity; globe temperature was measured by TR-52+Globe ball. After measuring, the data were collected by the collector TR-57DCi.

Figure- 4. Representative point

Vertical temperature

The vertical distribution of room temperature automatically measured by T&D MCR4+ thermocouple (With using SD card). The thermocouple was set to the height of 100mm, 600mm, 1100mm, 1600mm, 2100mm.

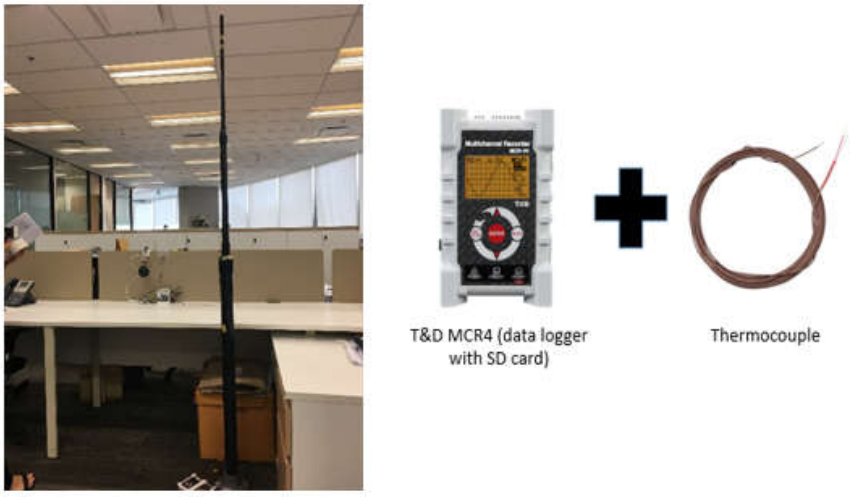


Figure- 5. Vertical distribution

CO2 Concentration

The carbon dioxide concentration measured by TR-76Ui.

Figure- 6. CO2 Concentration

Manual Measurement

Manual Measurement was adopted in the two-questionnaire day at 6 points, for understand thermal environment near occupants when they answer questionnaire. Testo 425 (anemometer) was used for measure the wind velocity. Measuring time is 10 minutes. After collect the data of wind velocity, the average value and time recorded by handwriting.

Figure- 7. Manual measurement device

2.2.4. Questionnaire

To clarify the evaluation of office workers for the indoor environment, questionnaire survey was conducted for office workers working in the measurement area.

The questionnaire was conducted two times on October 5th and 10th by paper form. The assessments of the thermal sensation were collected before working, 11:00, 15:00, and a feeling of the whole day was voted when leaving the office. The subjects of the questionnaire were part of the employees sitting in the survey area. The questionnaire asks about occupants' thermal feeling by thermal sensation and thermal comfort vote. For clo, we provided options that assumed work and calculated the total amount of clothing from the amount of partial clothing described in ISO 9920 (2005).

Table- 8. Occupants sensations and votes

Thermal sensation vote	Thermal Comfort
Very Hot	
Hot	
Warm	Uncomfortable
Slightly warm	Slightly uncomfortable
Neutral	Neutral
Slightly cool	Slightly comfortable
Cool	comfortable
Cold	
Very cold	

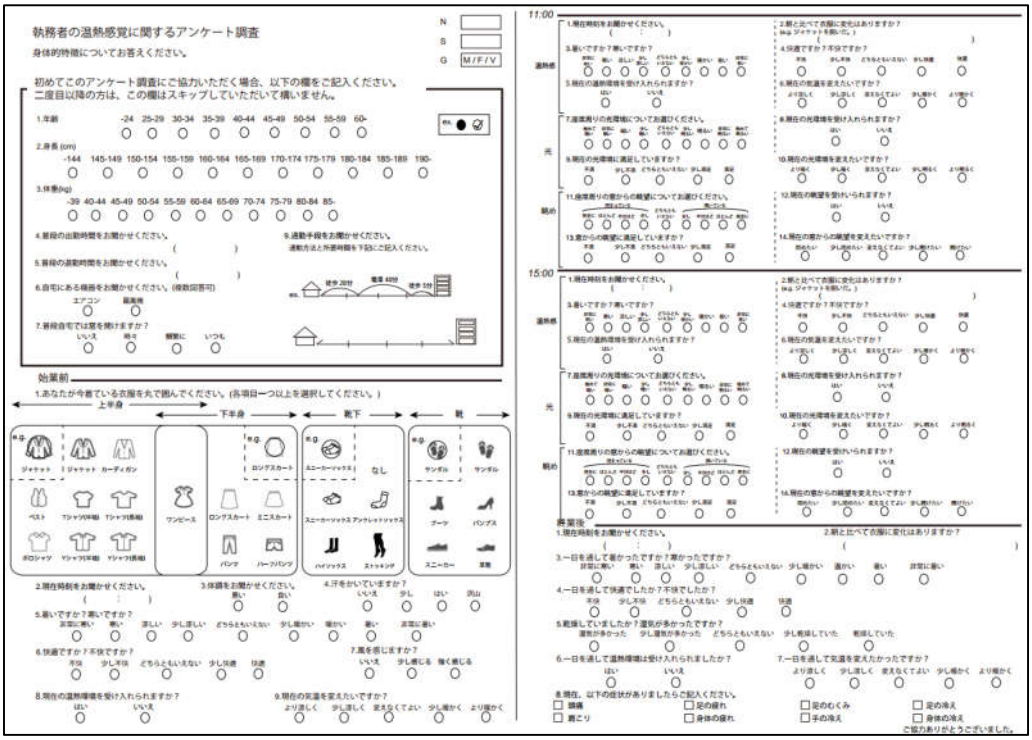


Figure- 8. The overview of the questionnaire.

2.2.5. 2D drawing & BEMS data

2D drawing of the target building and the BEMS data for survey are were provided by the building operator. The BEMS data include the energy consumption of outlet, lighting, AC power, and AC cold water for the survey region.

2.3. Case Study: Parameter Expressibility

As the first step of combine BIM and Cx, the expressibility of relevant parameters in BIM need to be verified. A model containing envelop objects HVAC system equipment was created in Revit 2019 student version. The required parameters were summarized from SHASE−M−0007−2005 and Ando's research [28], then entered into the model as more and detail as possible. The image of test model is shown in Figure-9.

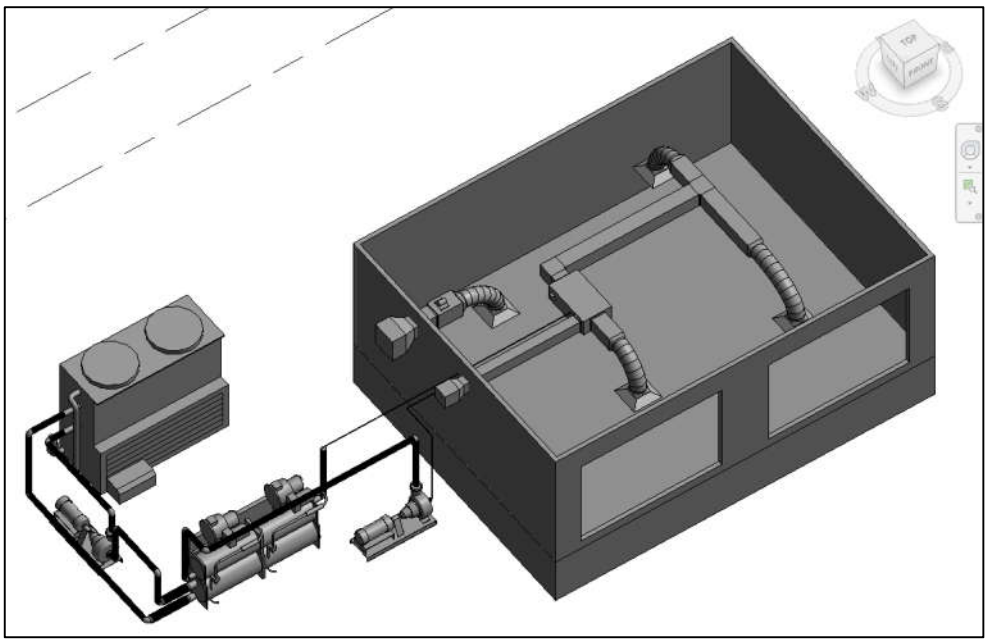


Figure- 9. The image of test model

The metric template file “Default_M_ENU.rte” which is the Revit default template was used as the project template. All the enclosure objects were load from default data base. The material and construction settings of enclosure objects were following the requirement in the ASHRAE Standard 140 BESTEST case 600. The families of wall, floor, and roof are using Revit built-in families. The “M_Window-Square Opening” family template in Revit family library was selected to make the window that without frames and trims. The HVAC entities consisted of cooling tower, chiller, AHU (cooling only, no heating and humidification function), exhaust fan, diffusers, pipe, duct, and fittings. All objects were “Mechanical Equipment” families, that load from the software library called “US Metric”, which can free download from Autodesk website. A thermal space named “FPT test” was placed and related to a thermal zone, some zone thermal information, e.g. load factors, schedules, was inputted into the space setting.

2.4. Case Study: Information Transferability

Wide range of data formats are used in Cx process for data management and energy consumption simulation. To investigate the transferability of related components and parameters in the BIM model, the model in last case study was tried to export to several file formats (Excel, gbXML, IDF) which be widely used for building simulation or maintenance. The results were checked, and the export methods, limitations and other settings have been introduced.

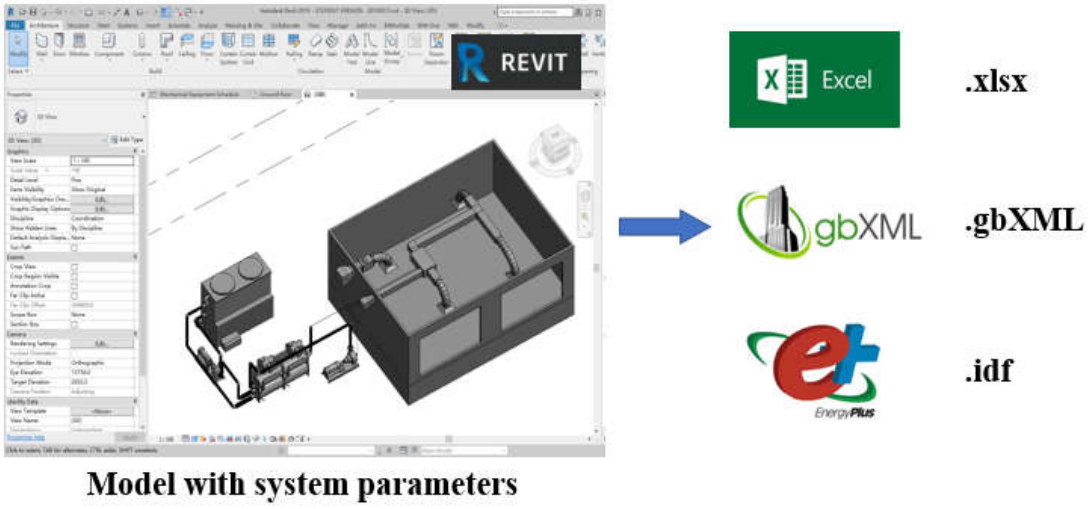


Figure- 10. Information transferability testing

Chapter 3. Results and Discussion

3.1. Survey & Questionnaire

3.1.1. Outdoor air conditions

The outdoor air conditions during the survey period were collected from Japan Meteorological Agency. The outdoor temperature and the absolute humidity of survey period days are Figure-11 and Figure-12 as below. The maximum outdoor temperatures on September 28, October 1, 2, 9, and 10 were higher than the air conditioning setting temperatures (25℃). The hottest and coldest hour is respectively 31.4℃ at 12 a.m. 10/01, and 14.4℃ at 4 a.m. 9/28.

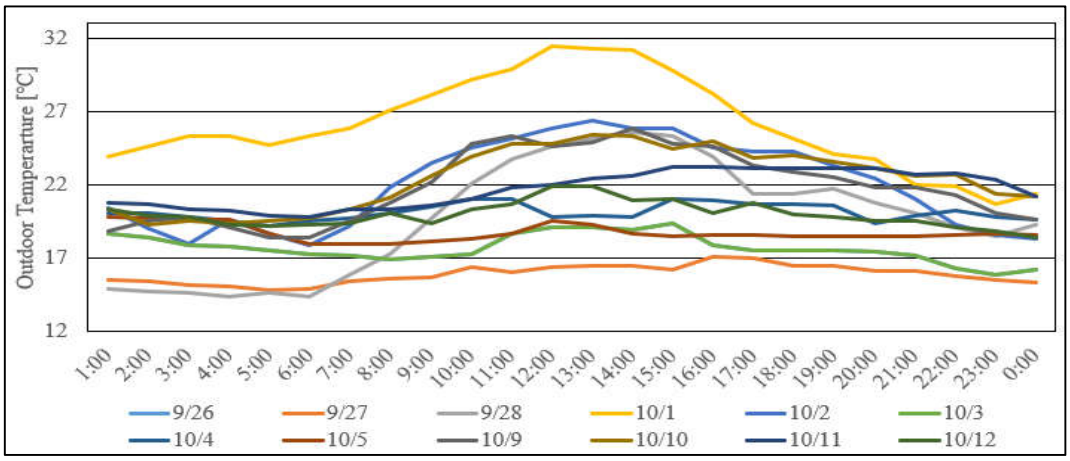


Figure- 11. Outdoor temperature during survey period (9/26~10/12)

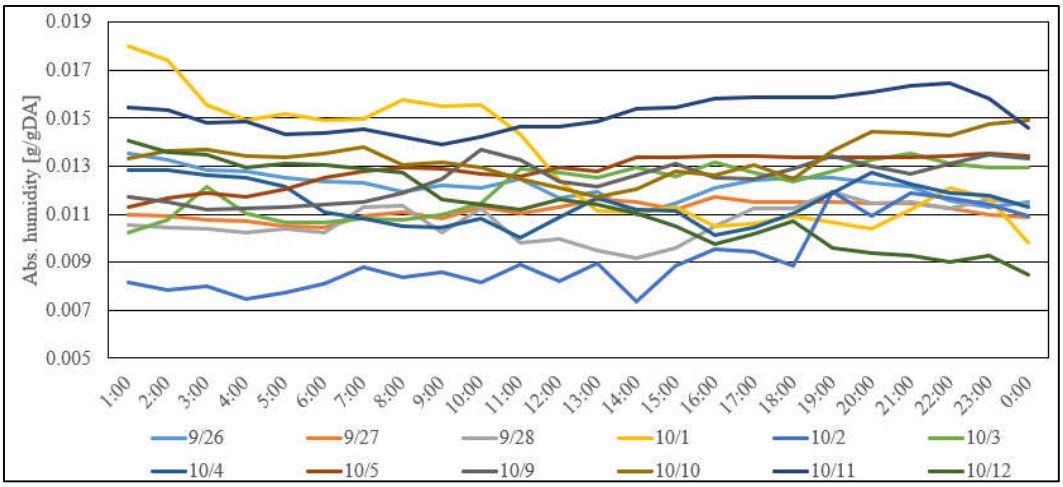


Figure- 12. Outdoor Abs. humidity during survey period (9/26~10/12)

3.1.2. Measurement

The temperature change of representative point and outlet are showing in Figure-13 to 24.

As the results showing, the temperature of each representative point changed very frequently, rise or fall by about 1~2 degrees every half hour during the operation period. The temperature of AO1 also changed very often. The temperature of AO2 only drop to about 19℃ on the days when the outdoor temperature was higher than the indoor setting temperature (25℃). The reason for the change is presumed to be that the time threshold setting for the temperature automatically adjusting of the air conditioning system in the target region is inappropriate.

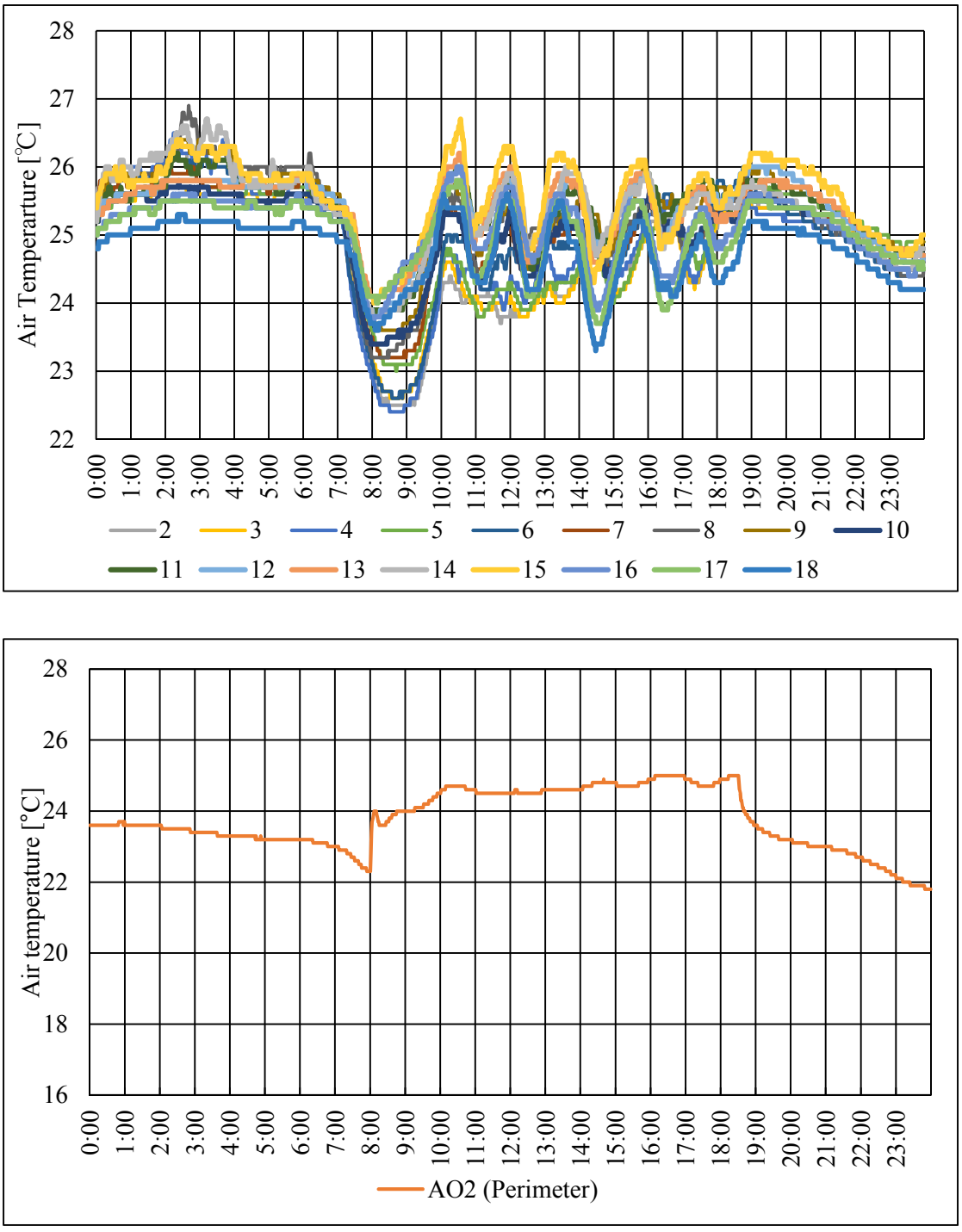


Figure- 13. Temperature change of representative point and outlet on 9/26

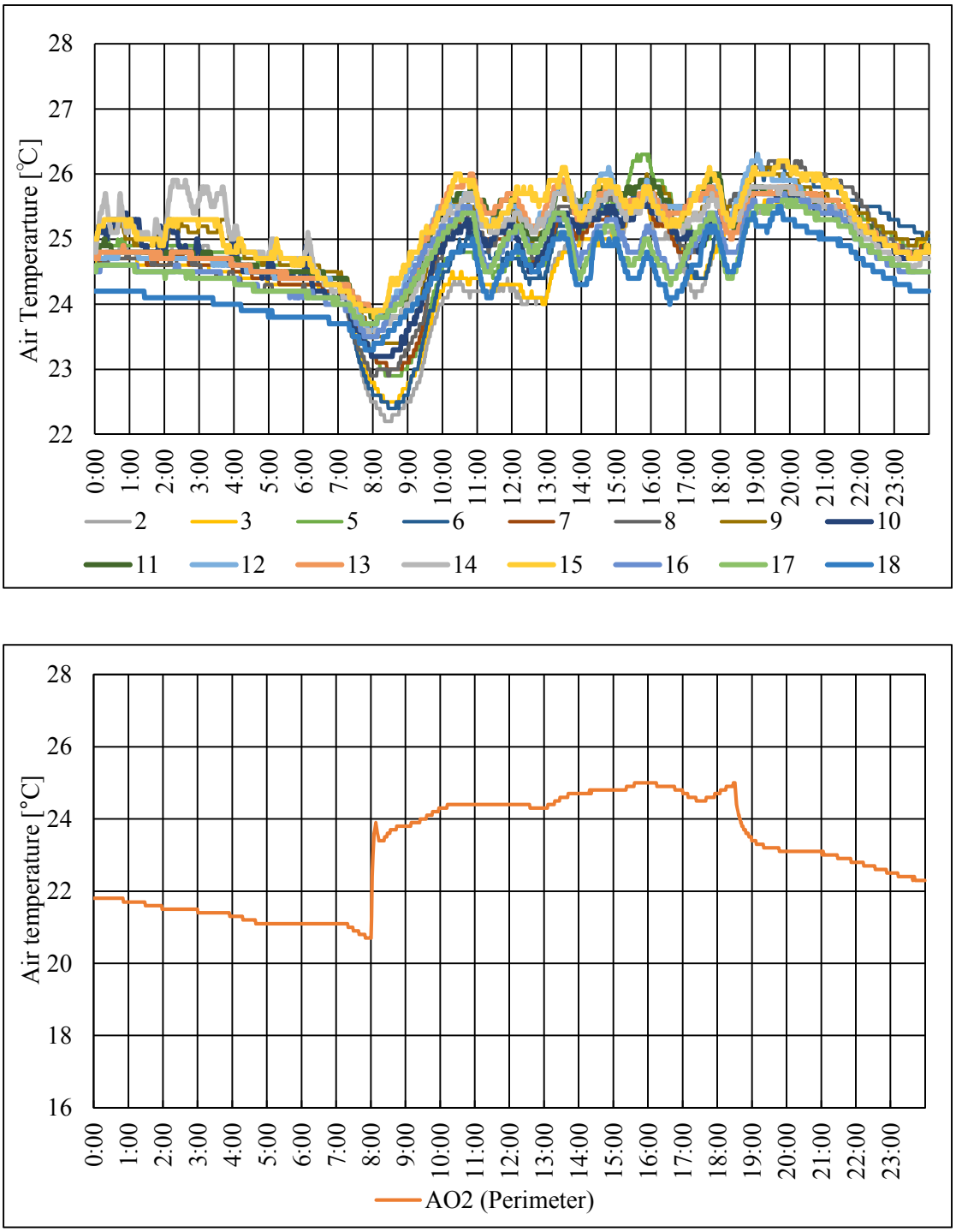


Figure- 14. Temperature change of representative point and outlet on 9/27

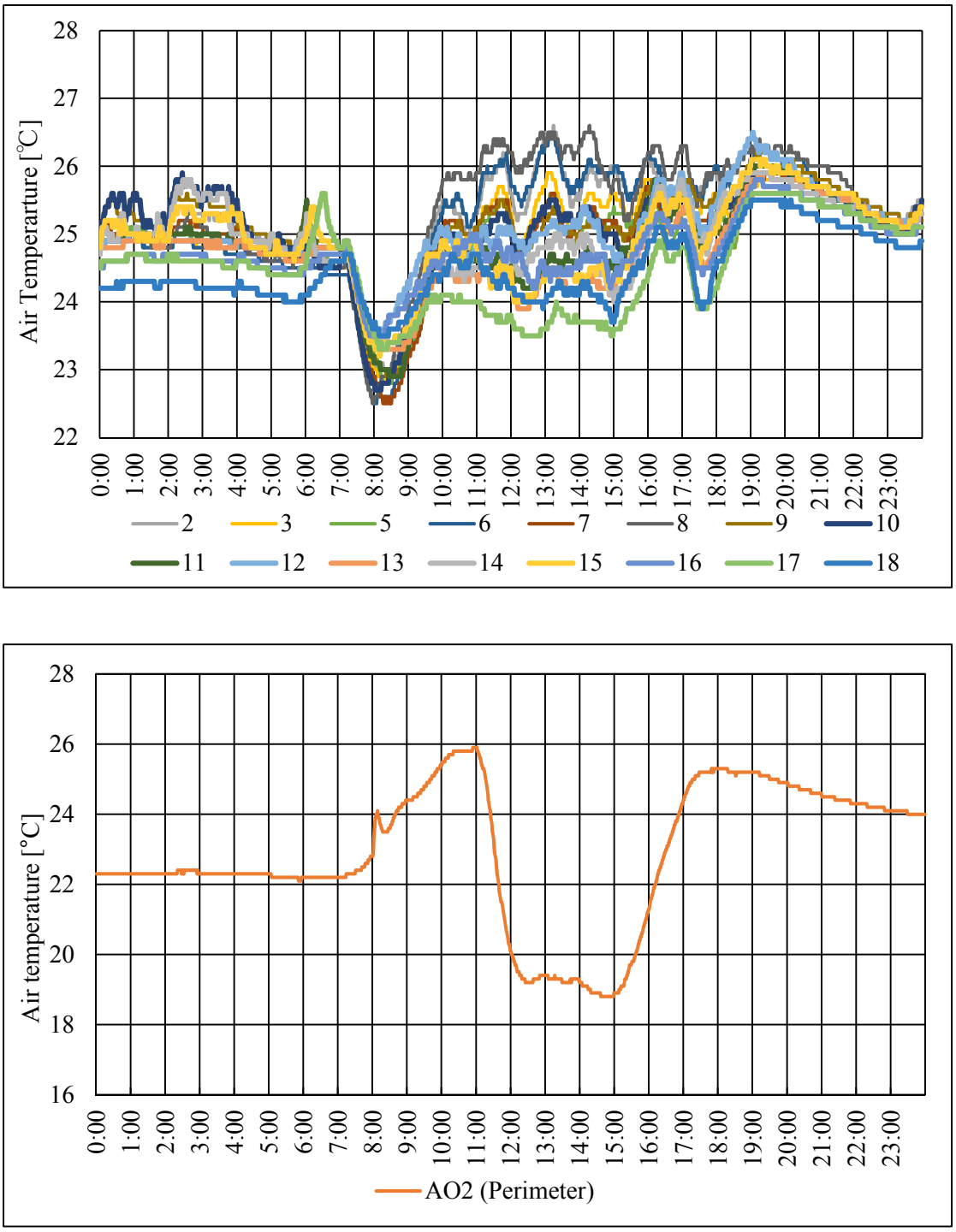


Figure- 15. Temperature change of representative point and outlet on 9/28

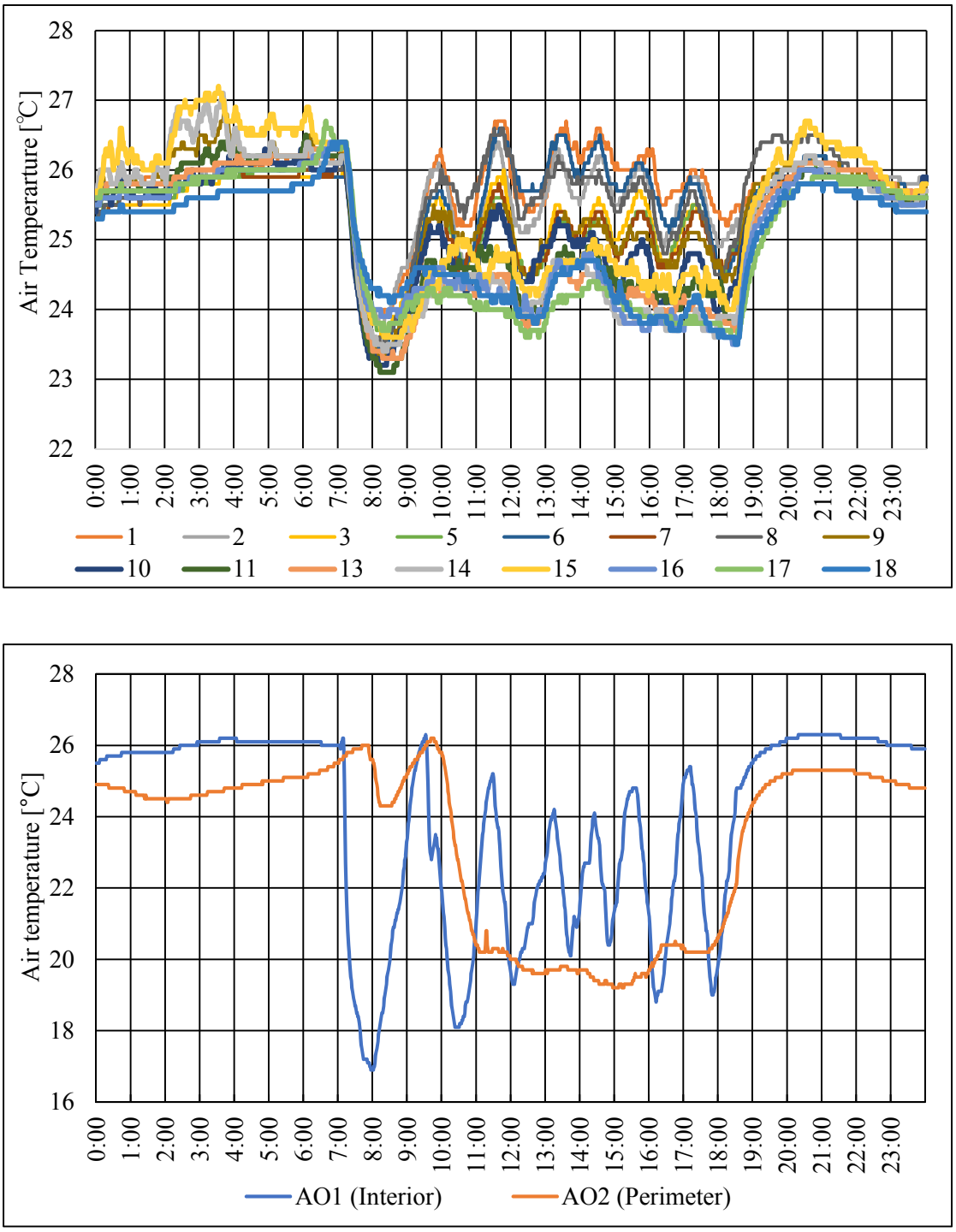


Figure- 16. Temperature change of representative point and outlet on 10/01

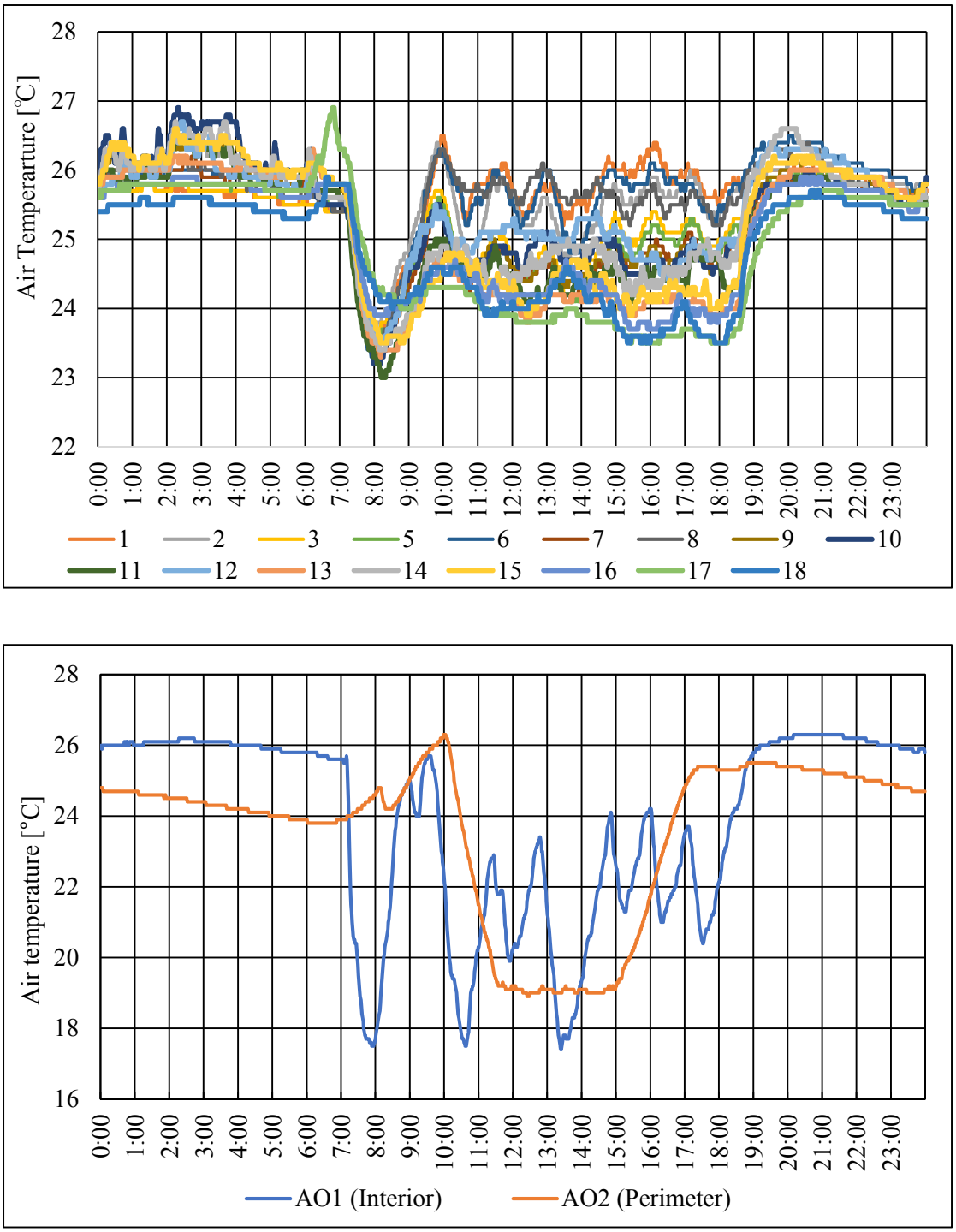


Figure- 17. Temperature change of representative point and outlet on 10/02

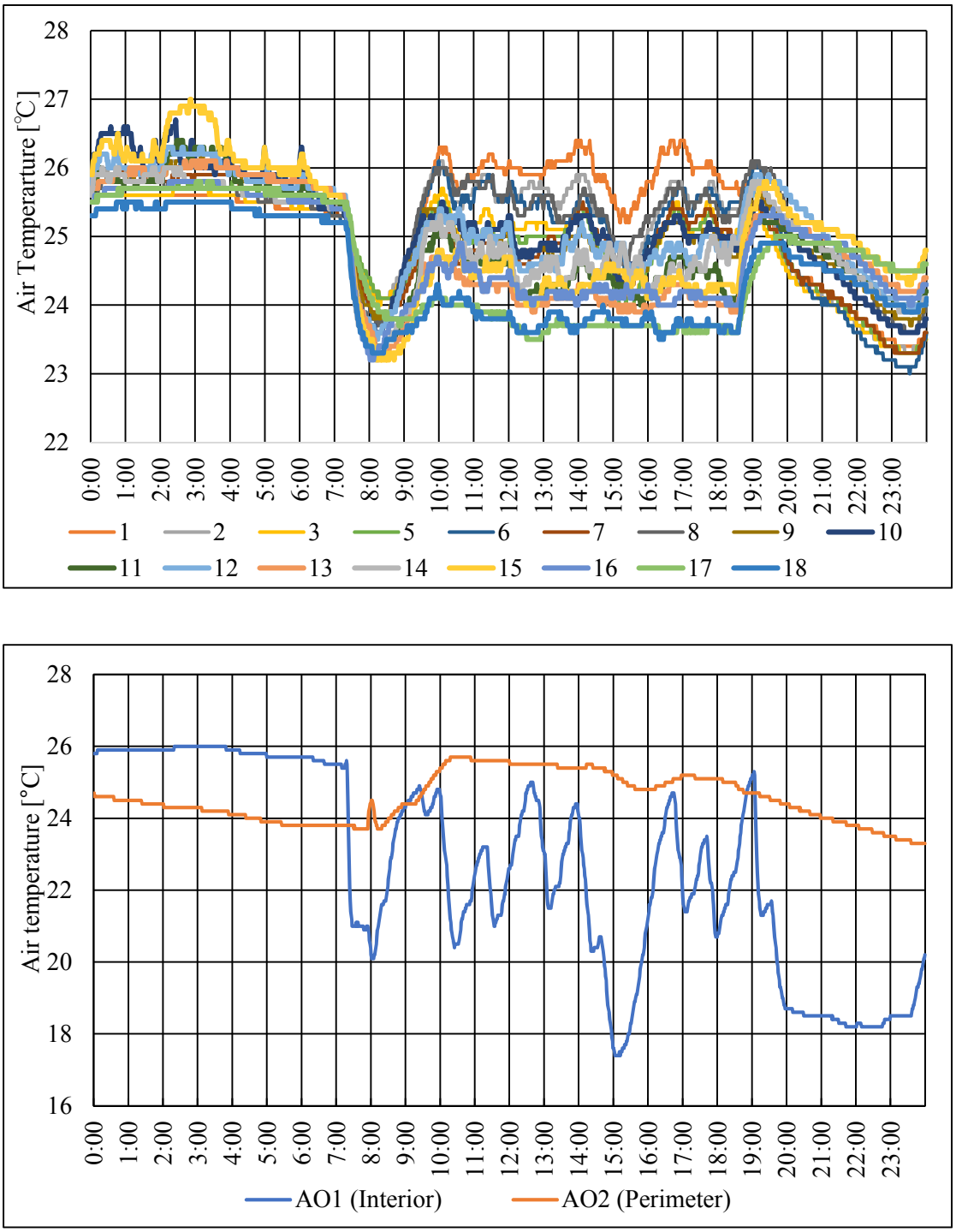


Figure- 18. Temperature change of representative point and outlet on 10/03

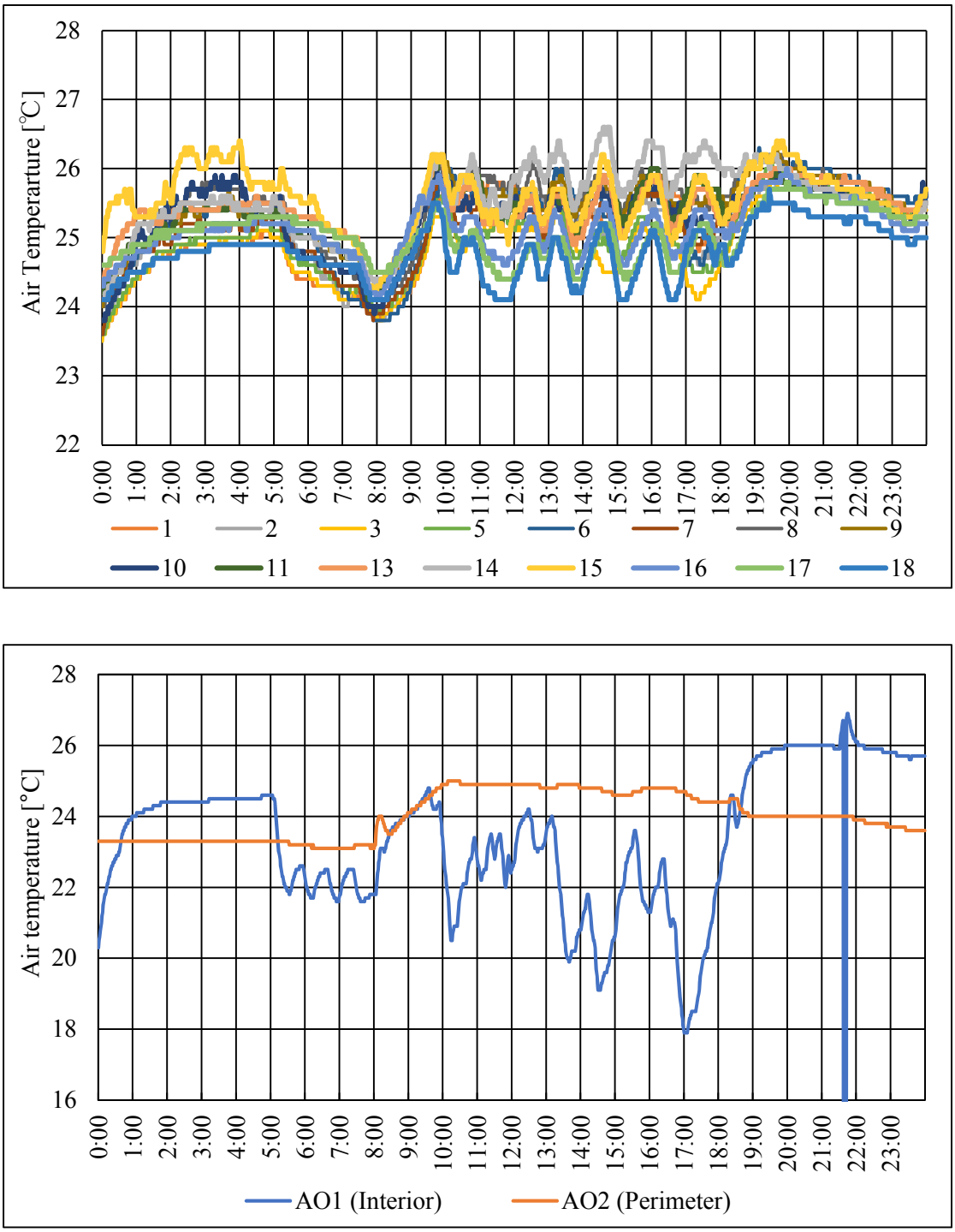


Figure- 19. Temperature change of representative point and outlet on 10/04

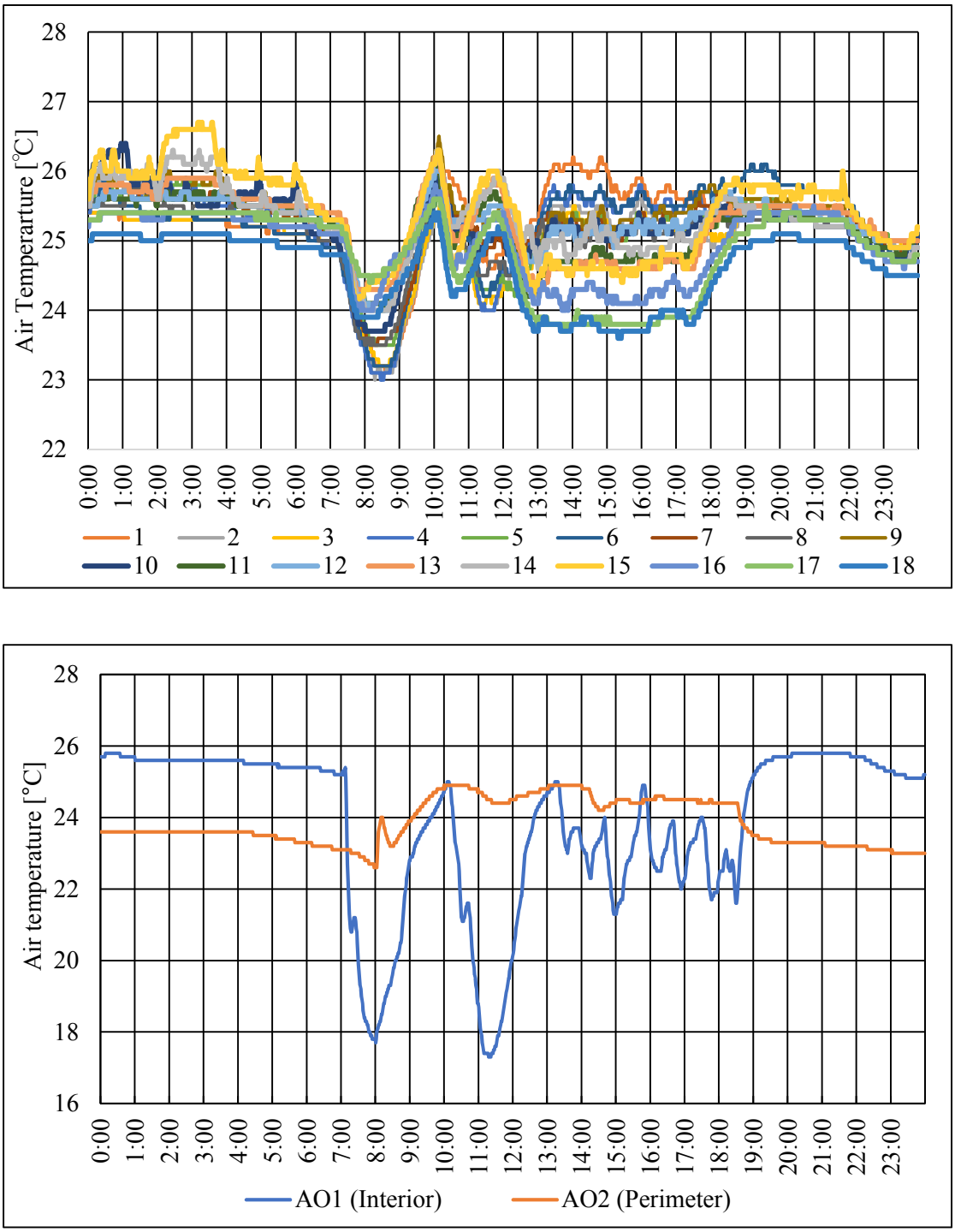


Figure- 20. Temperature change of representative point and outlet on 10/05

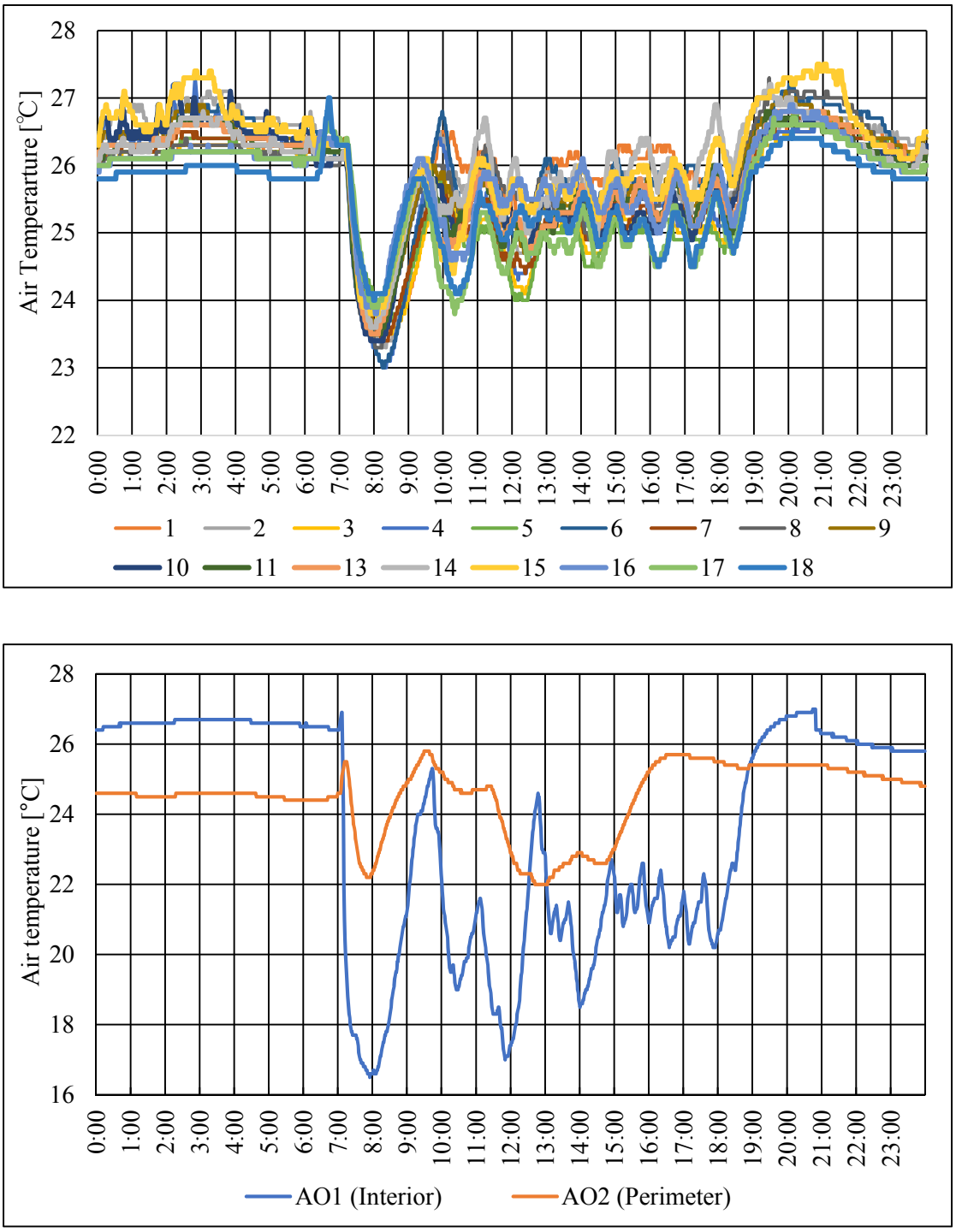


Figure- 21. Temperature change of representative point and outlet on 10/09

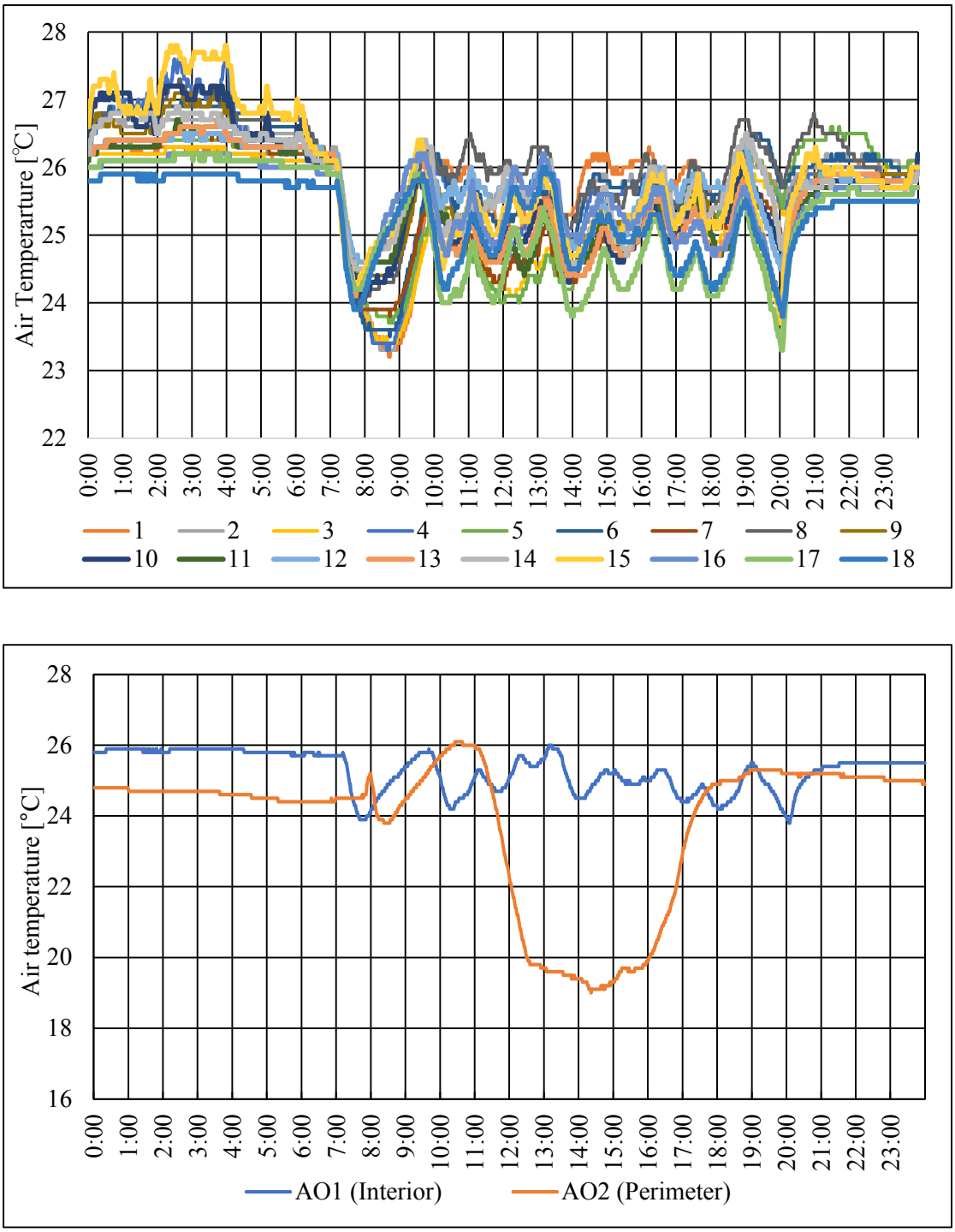


Figure- 22. Temperature change of representative point and outlet on 10/10

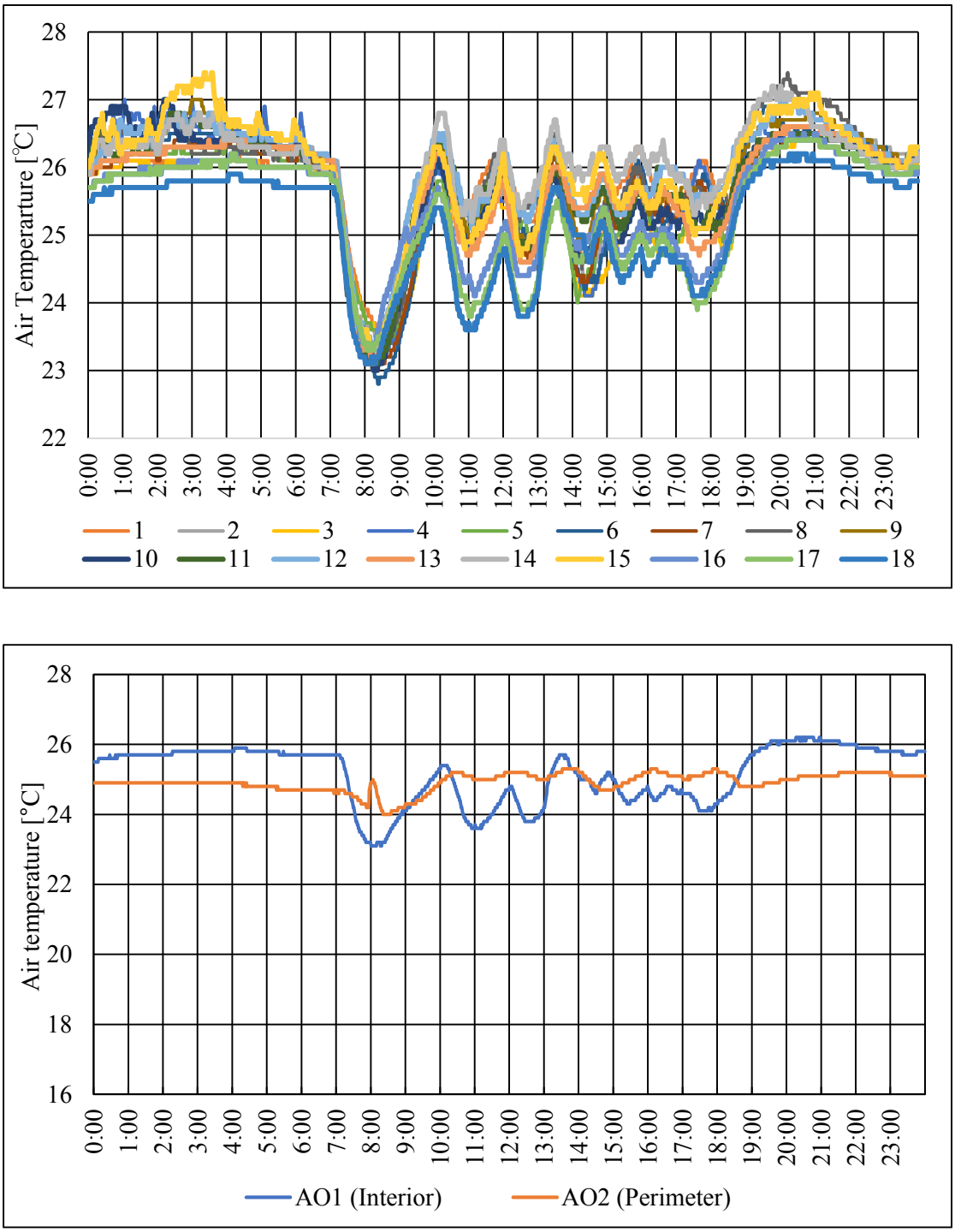


Figure- 23. Temperature change of representative point and outlet on 10/11

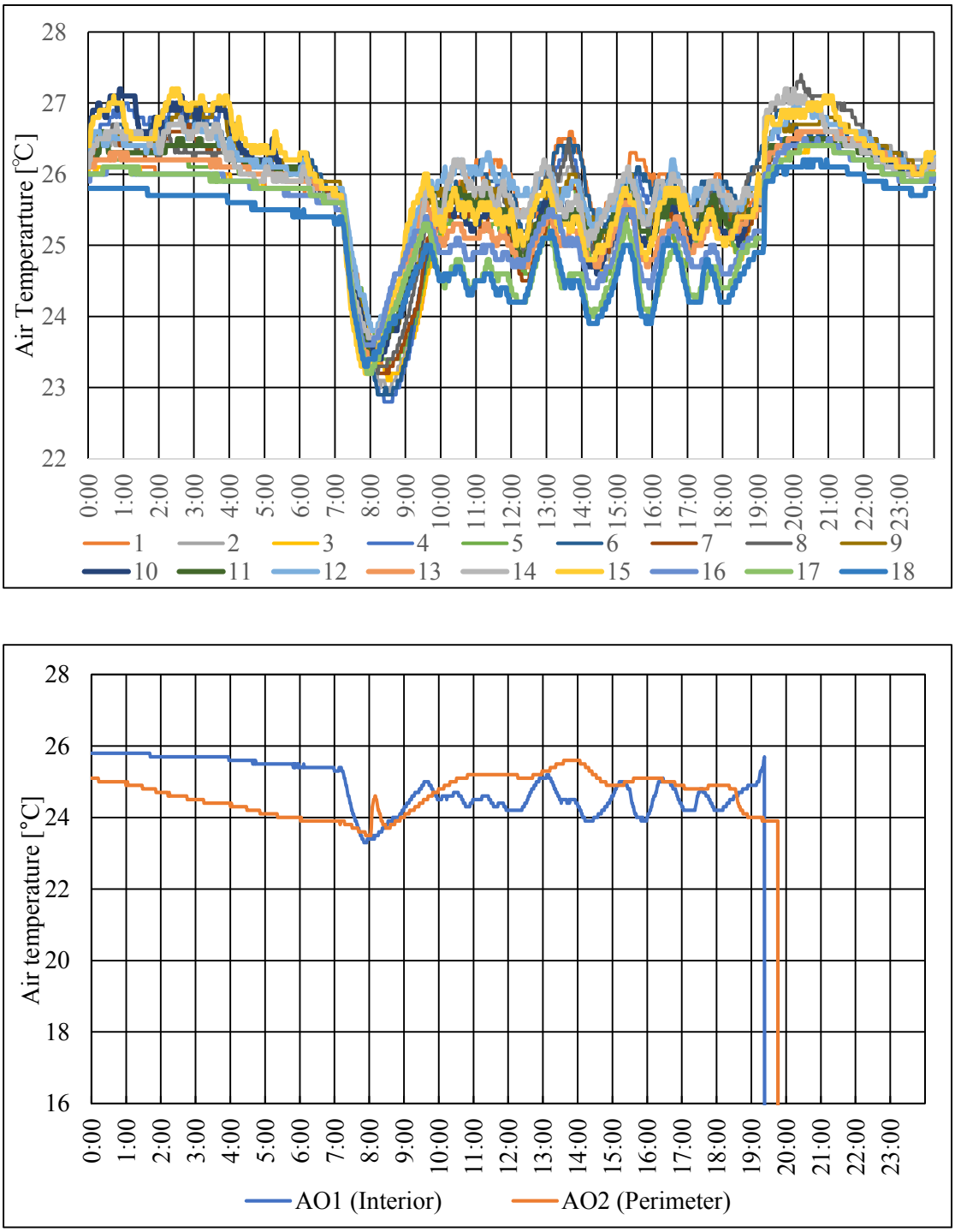


Figure- 24. Temperature change of representative point and outlet on 10/12

3.1.3. Questionnaire

44 questionnaire answers were received. Among them, 30 were males, 14 were females. 47.3% of all male respondents are 40s; 37.5% of female are around 35-39 years old. The heights of male and female are concentrated in the interval of 170~174 and 155~159 respectively. The weight of male respondents is mostly in the larger range of 60-74, and the weight of female in the range of 50-54 is 37.5%. For the thermal resistance of clothing, 39% of male were 0.5clo, 32% were 0.6clo. 30% of female were 0.3clo, another 30% were0.5clo.

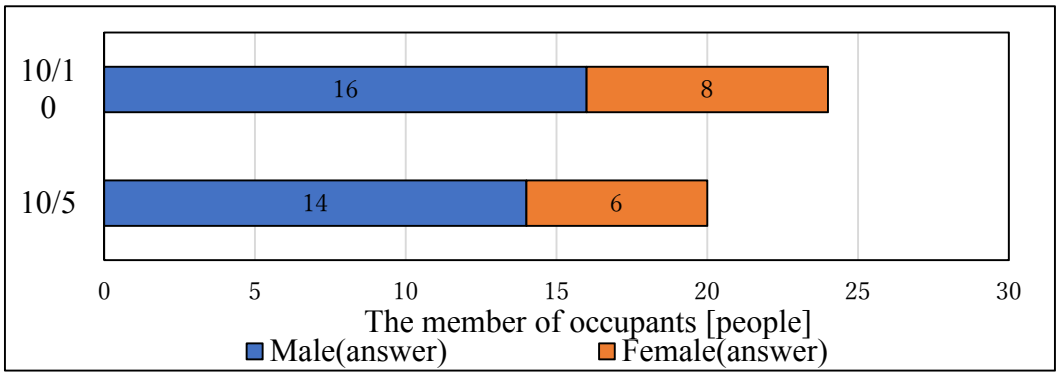


Figure- 25. Distribution of male and female population in questionnaire

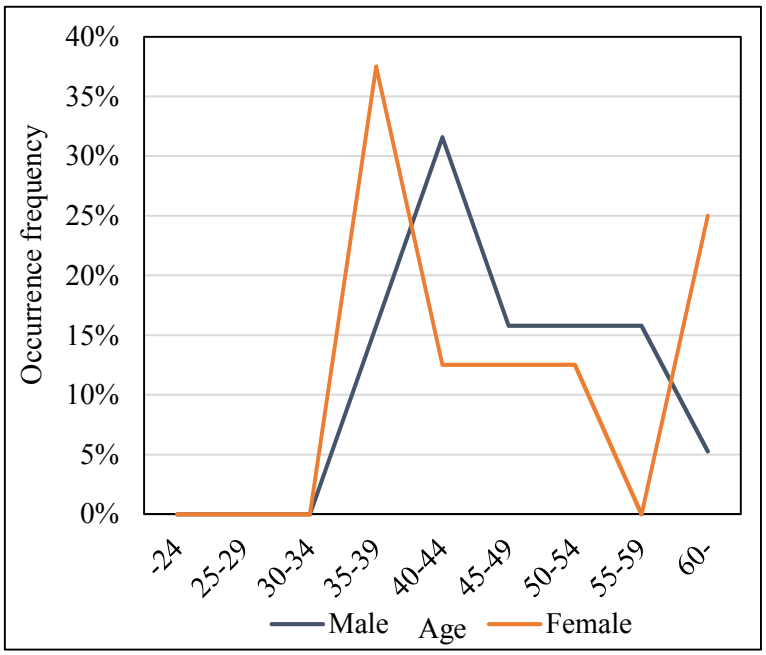


Figure- 26. Age distribution of the respondents

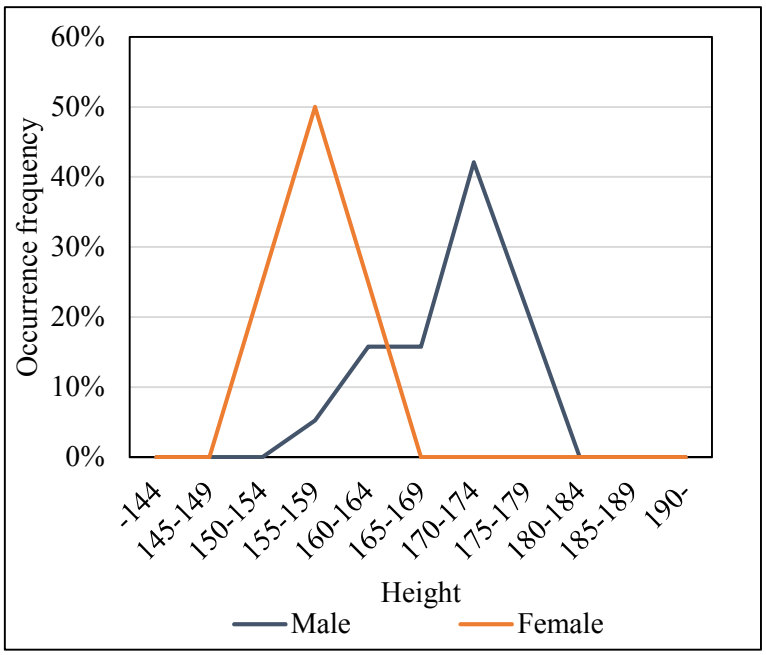


Figure- 27. Height distribution of the respondents

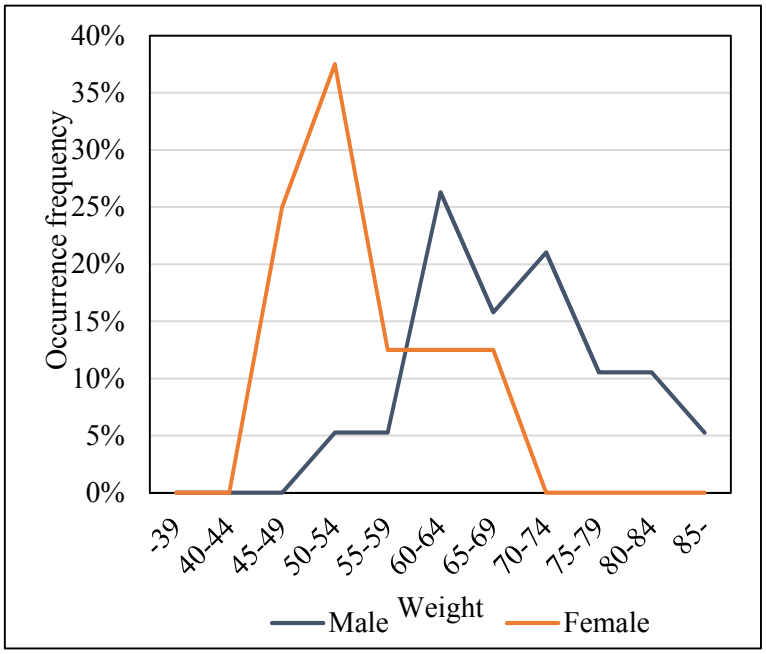


Figure- 28. Weight distribution of the respondents

The TSV and TC vote results are showing in Figure-29 and Figure-30. More than half of respondents felt “slightly warm” and “slightly discomfort” at the time of before working. The TSV results of the 11:00, 15:00, and the whole day evaluation showed

that over half of the respondents felt natural, and the TC votes were mainly natural or slightly comfort.

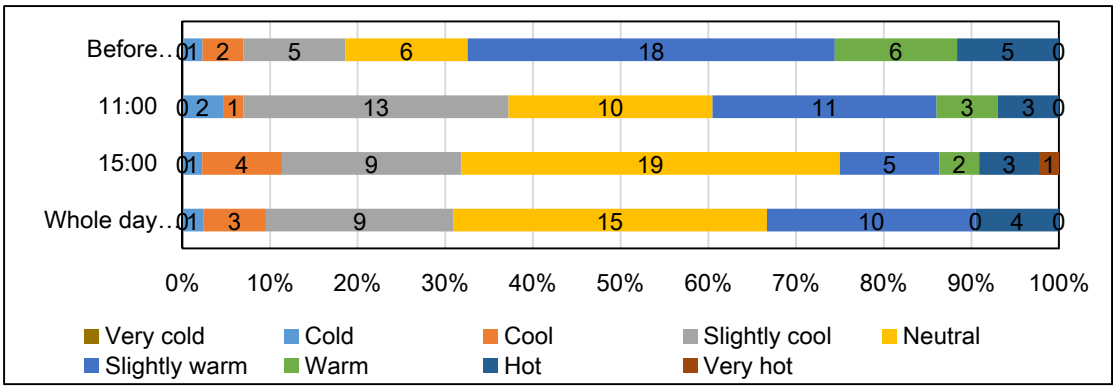


Figure- 29. Ratio of thermal sensation votes

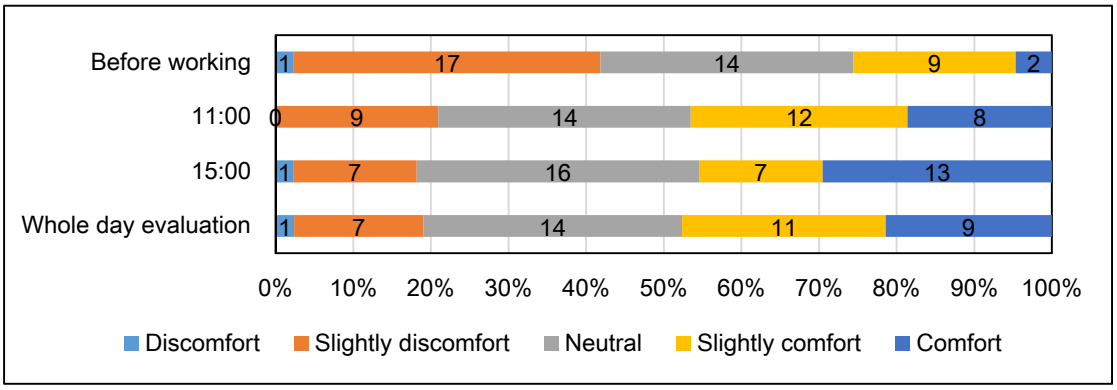


Figure- 30. Ratio of thermal comfort answer

3.1.4. Energy consumption

The energy consumption of the measured area during the measured period summarized from the BEMS are shown in Figure-31 to 42. The value here are primary energy consumption that converted by the BEMS system. The results show that the cold water consumption of air conditioning system accounts for the vast majority of energy consumption every day, and its significantly affected by the outdoor temperature of the day.

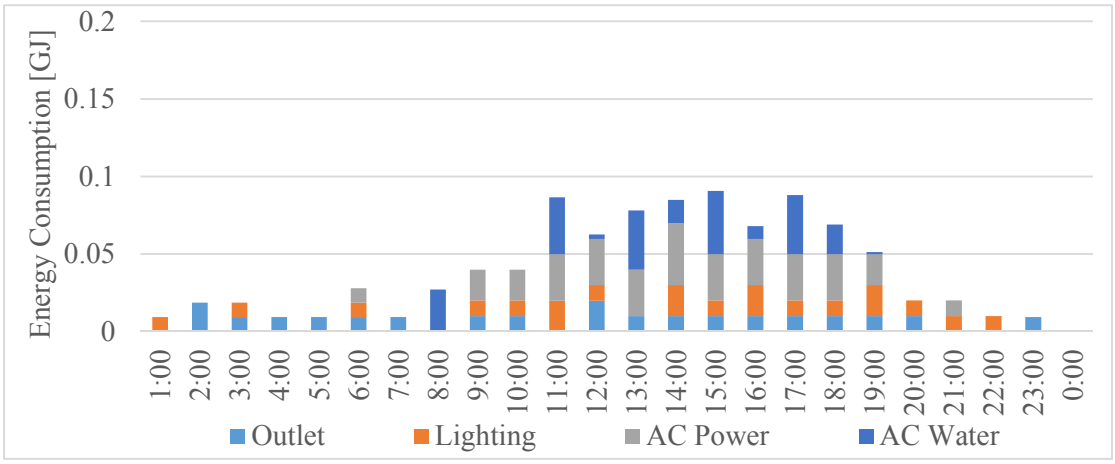


Figure- 31. Energy consumption on 9/26

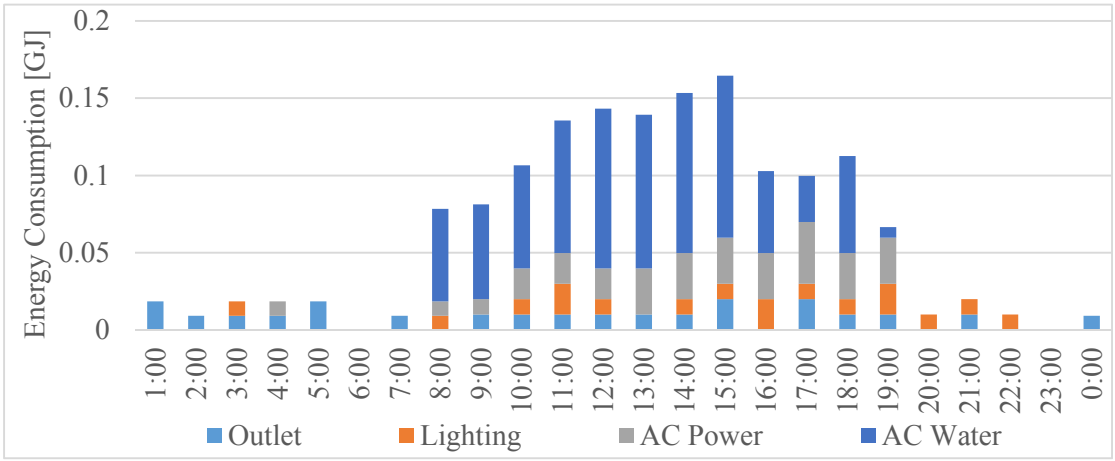


Figure- 32. Energy consumption on 9/27

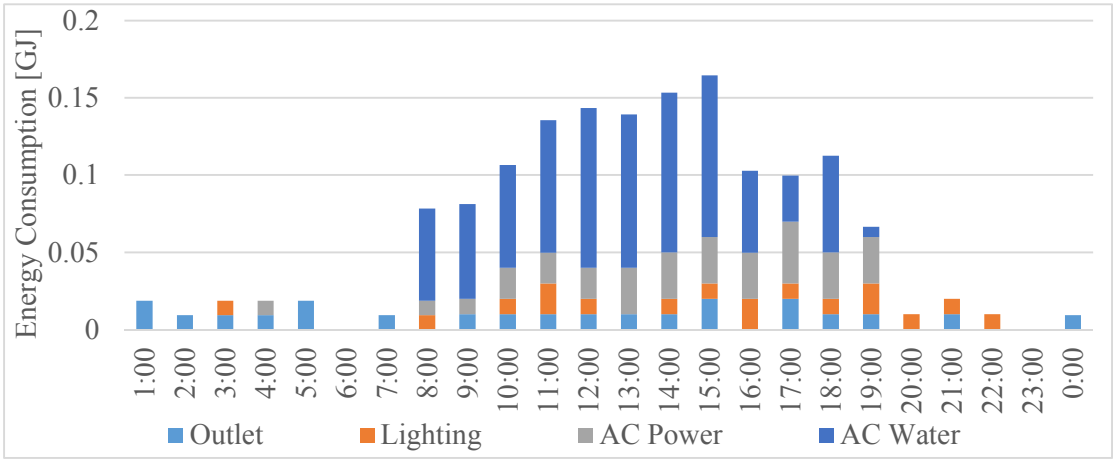


Figure- 33. Energy consumption on 9/28

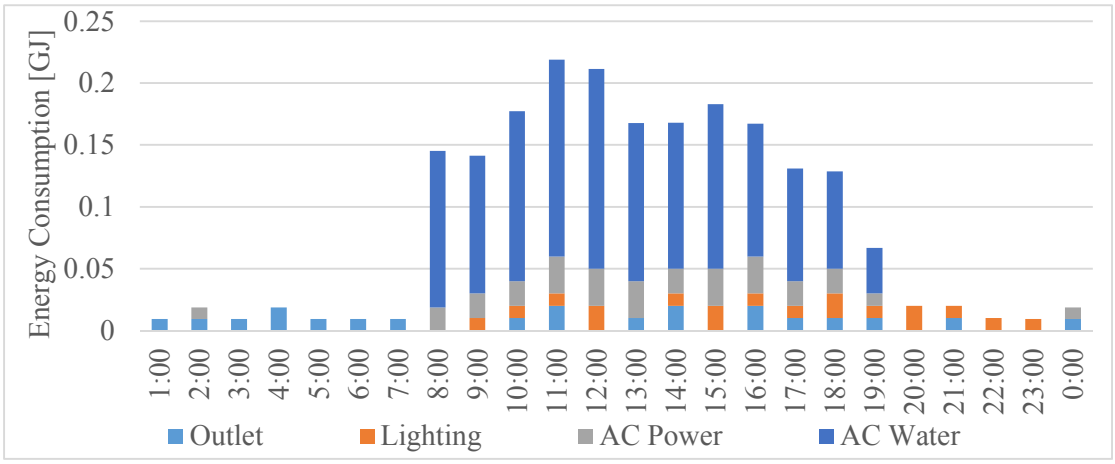


Figure- 34. Energy consumption on 10/01

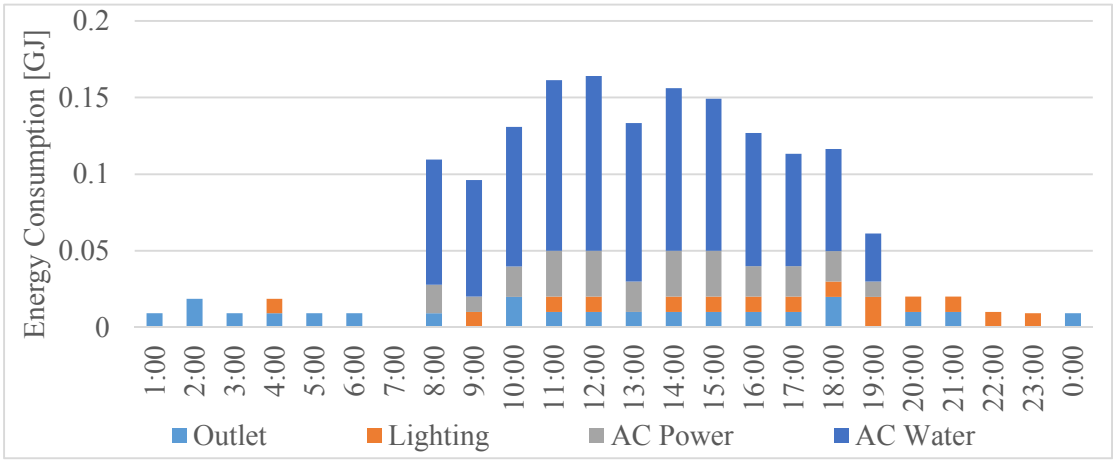


Figure- 35. Energy consumption on 10/02

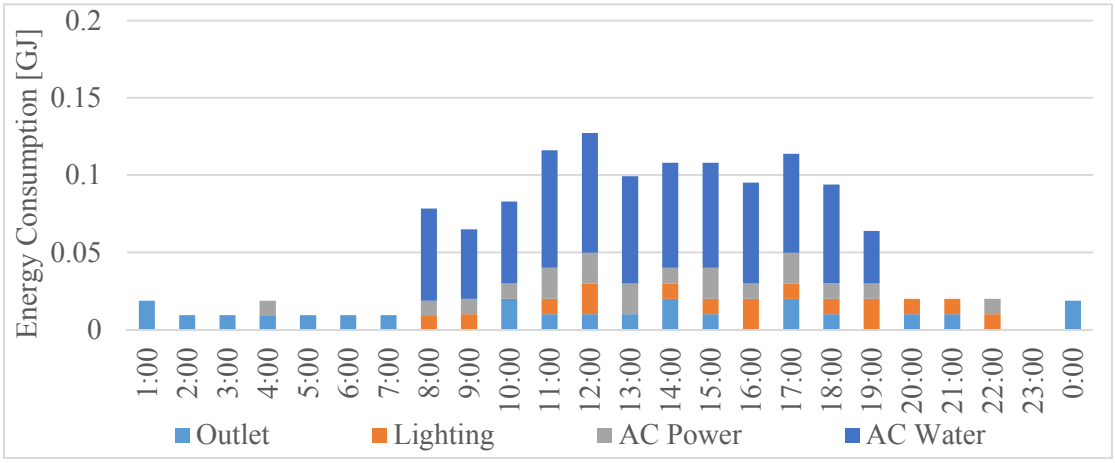


Figure- 36. Energy consumption on 10/03

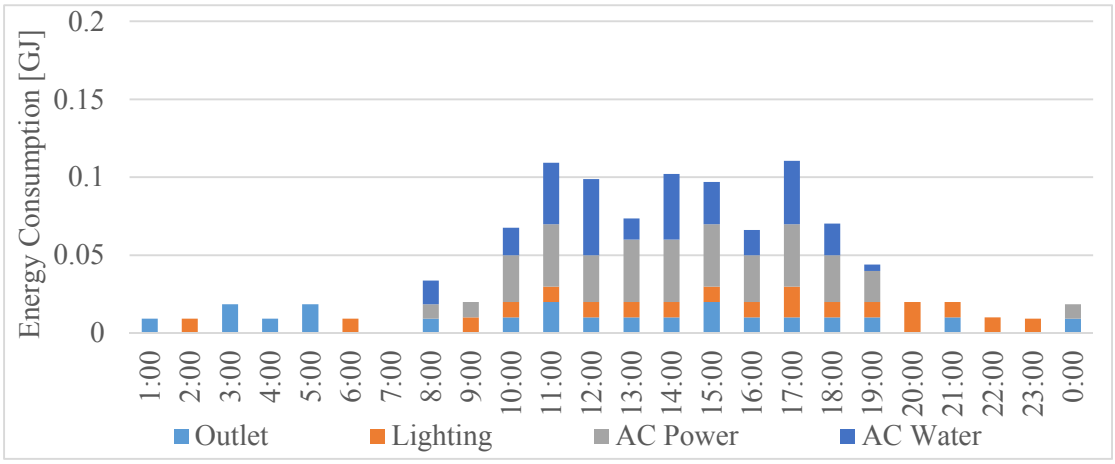


Figure- 37. Energy consumption on 10/04

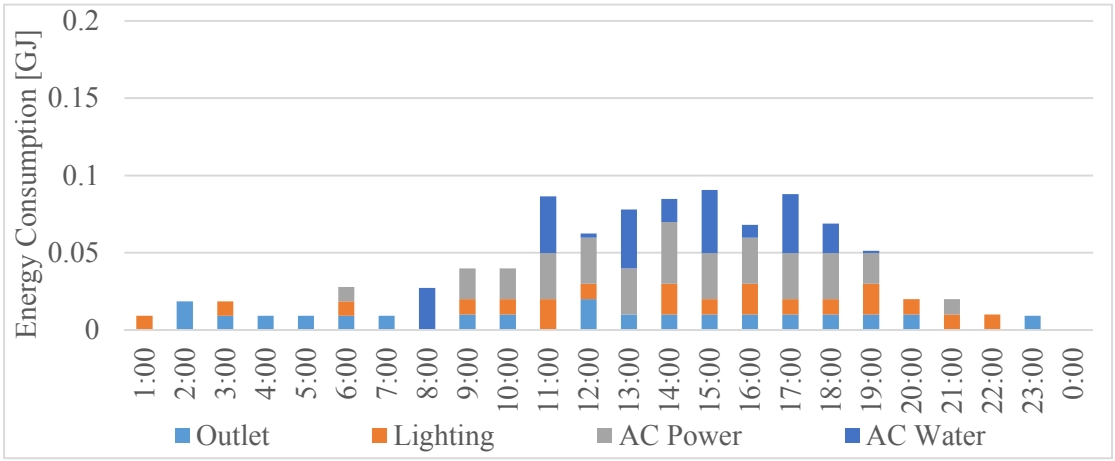


Figure- 38. Energy consumption on 10/05

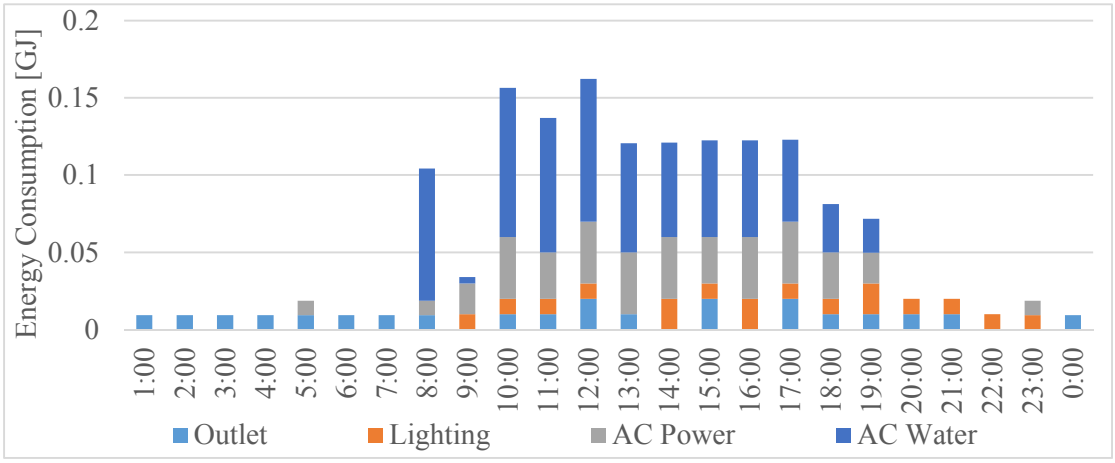


Figure- 39. Energy consumption on 10/09

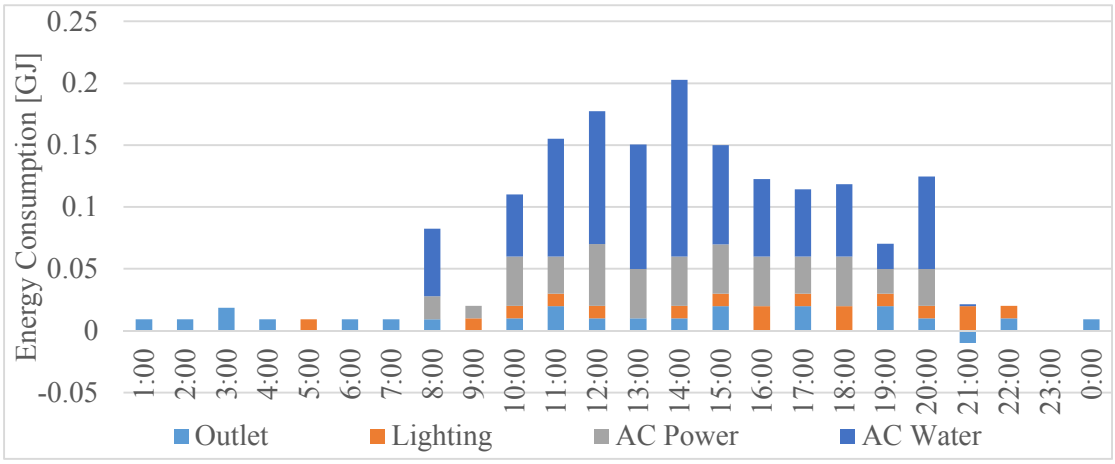


Figure- 40. Energy consumption on 10/10

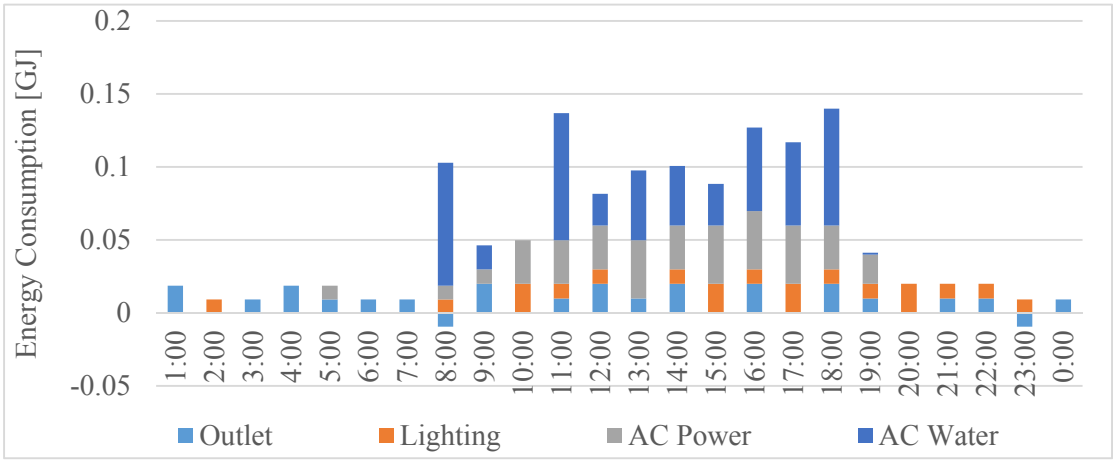


Figure- 41. Energy consumption on 10/11

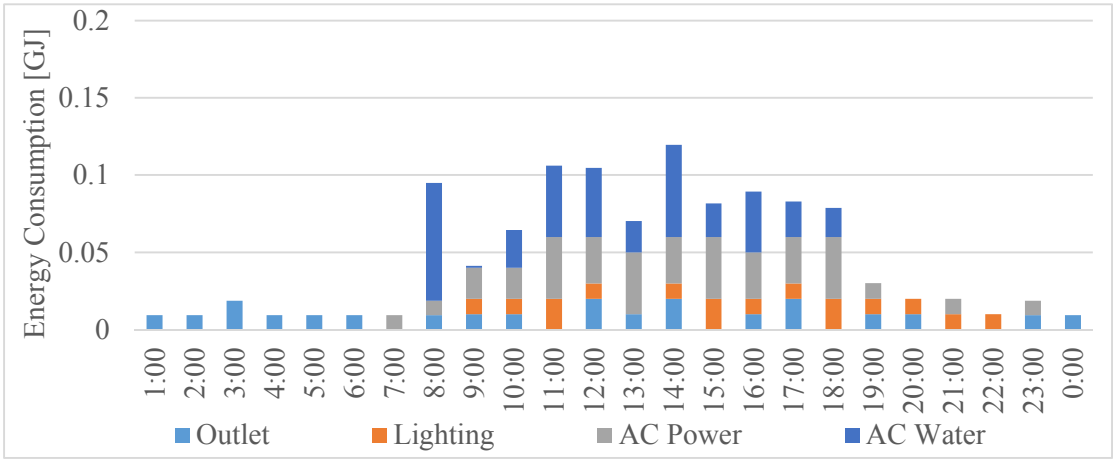


Figure- 42. Energy consumption on 10/12

3.2. Parameter Expressibility

For the expressibility, the testing results are showing in Table-9. The project common information was enterable through location and zone settings. The relevant parameters belonging to the object itself were well performed in the BIM model. For duct and pipe system, only the flow expressed, other parameters like temperature or relative humidity were not successfully added. The air temperature and humidity set point of each zone can be set in the zone setting, but the demand for indoor and outdoor air conditions was not expressed as expected.

Table- 9. Parameters expressibility in BIM model

FPT Required Parameters			Expressible
Project common	Location	Latitude	O
		Longitude	O
		Elevation	X
	Cooling Setpoint	Temperature	O
		Humidity	O
	Heating Setpoint	Temperature	O
		Humidity	O
Heat Source System	Chiller	Operational State	O
		Electrical load	O
		Chilled Water Inlet Temperature	O
		Chilled Water Outlet Temperature	O
		Cooling Water Inlet Temperature	O
		Cooling Water Outlet Temperature	O
		Chilled Water Flow	O
	Cold Water Pump	Operational State	O
		Electrical load	O
	Cooling Tower	Operational State	O
		Electrical load	O

		Inlet Air DB Temperature	O
		Outlet Air DB Temperature	O
		Inlet Cooling Water Temperature	O
		Outlet Cooling Water Temperature	O
		Inlet Air RH	O
		Outlet Air RH	O
		Cooling Water Flow	O
		Make-up Water Flow	O
	Cooling Water Pump	Operational State	O
		Electrical load	O
	Outdoor Air	Outdoor Air DB Temperature	X
		Outdoor Air RH	X
Water Transportation System	Piping	Secondary Supply Water Temperature	X
		Secondary Return Water Temperature	X
		Secondary Water Flow	O
		Secondary Water pressure	X
	Pump	Pump Suction Pressure	O
		Pump Discharge Pressure	O
		Operational State	O
		Electrical load	O
	Heat Source	Inlet Water Temperature	O
		Outlet Water Temperature	O
		Water Flow	O
Air Conditioning System	Air Side (Duct)	SA Temperature	X
		RA Temperature	X
		OA Temperature	X
		MA Temperature	O
		SA RH	X
		RA RH	X
		OA RH	X
		MA RH	O
		SA Flow	O

		OA Flow	O
		SA Pressure	X
	Water Side (Pipe)	Cold Water Inlet Temperature	X
		Cold Water Outlet Temperature	X
		Cold Water Flow	O
	Fan	Electrical load	O
		Frequency	O
	Indoor	Room Temperature	X
		Room RH	X
	Outdoor	Outdoor Temperature	X
		Outdoor RH	X
Ventilation System	Fan	Air Flow	O
		Air Temperature	X
		Suction Static Pressure	X
		Discharge static Pressure	X
		Electrical load	O
		Frequency (Inverter)	O

3.3. Information Transferability

Wide range of data formats are used in building simulation software.

In this work, the transferability of Excel, gbXML, IDF have been examined. Export methods, limitations and other settings have been introduced.

3.3.1. Excel

With proper settings, almost all parameters in HVAC object could be exported to an Excel file. The whole process is showing as Figure-43 below.

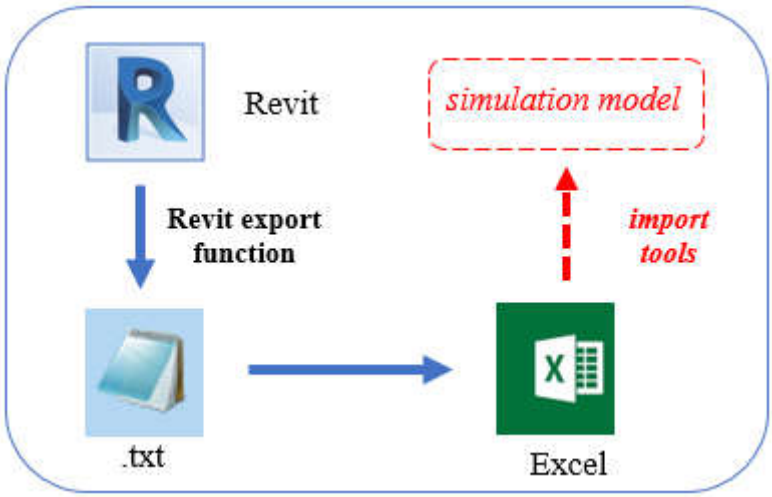


Figure- 43. Parameter exporting process (Revit→Excel)

Firstly, the parameters must be created as “shared parameters” which is a special parameter type and load to a family, as Figure-44 showing.

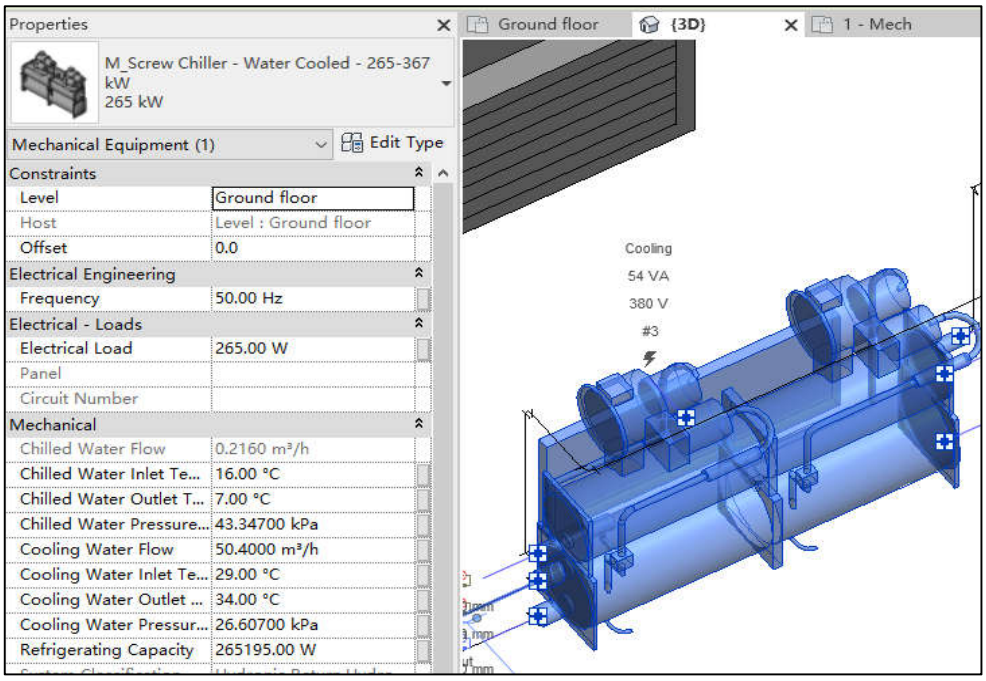
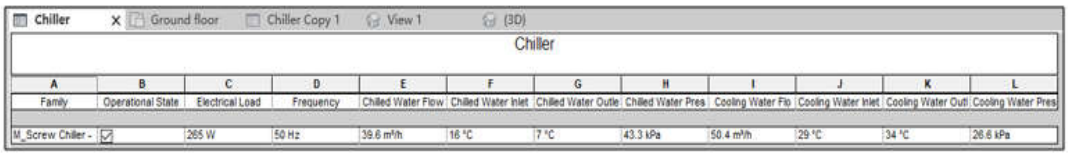


Figure- 44. Add “shared parameters” into HVAC component

After that, create a “schedule” for target parameters, then export that schedule to a text file by report exporting function as shown in Figure-45. Finally, load the text file into excel.

Parameters “Schedule” in Revit:

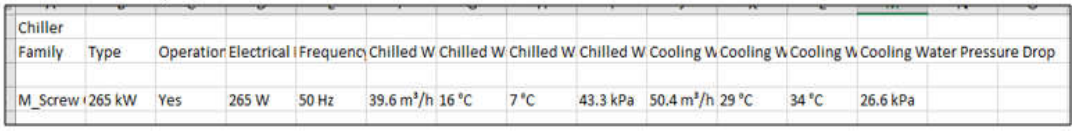


Chiller | Ground floor | Chiller Copy 1 | View 1 | {3D}

Chiller

A	B	C	D	E	F	G	H	I	J	K	L
Family	Operational State	Electrical Load	Frequency	Chilled Water Flow	Chilled Water Inlet	Chilled Water Outle	Chilled Water Pres	Cooling Water Flo	Cooling Water Inlet	Cooling Water Outl	Cooling Water Pres
M_Screw Chiller -	☑	265 W	50 Hz	39.6 m³/h	16 °C	7 °C	43.3 kPa	50.4 m³/h	29 °C	34 °C	26.6 kPa

Parameters exported into Excel:



Chiller												
Family	Type	Operation	Electrical	Frequenc	Chilled W	Chilled W	Chilled W	Chilled W	Cooling W	Cooling W	Cooling W	Cooling Water Pressure Drop
M_Screw	265 kW	Yes	265 W	50 Hz	39.6 m³/h	16 °C	7 °C	43.3 kPa	50.4 m³/h	29 °C	34 °C	26.6 kPa

Figure- 45. Parameters in Revit “schedule” and exported into Excel.

It is expected that in the future HVAC entities parameters could export to Excel first, then import into the corresponding simulation model by some import tools like a VBA form.

3.3.2. gbXML & IDF

After serval times of testing, the feasible exporting method of gbXML & IDF format was defined. The considerations for model making and export settings were summarized.

The first attention of model making is, due to the position of the roof is determined as the upper surface at the time of export, and the position in the Revit is judged as "Base offset Form Level", i.e., the distance from the bottom surface to the “Base Level”, the height of the top surface of the roof needs to be manually adjust to the same height as the wall. The image is showing as Figure-46.

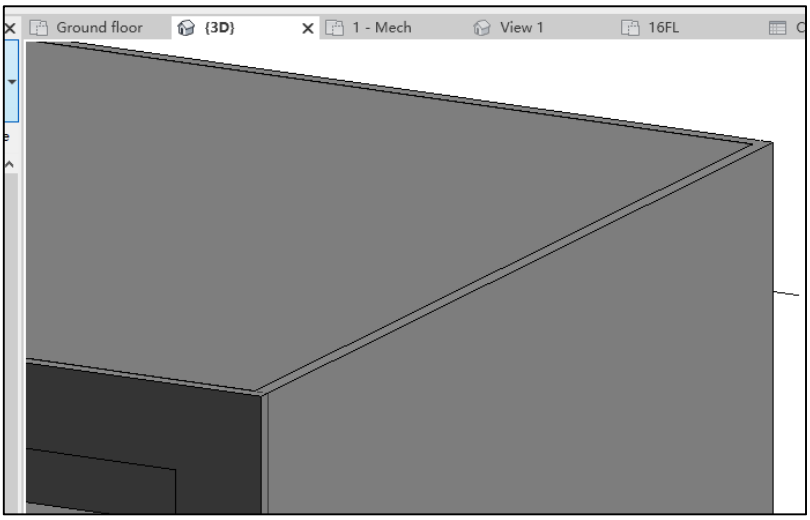


Figure- 46. The correct roof position for exporting

The zone power, lighting, people load factors, and schedules could be easily entered in space setting. And for delivery, the space must be put and link up with a zone.

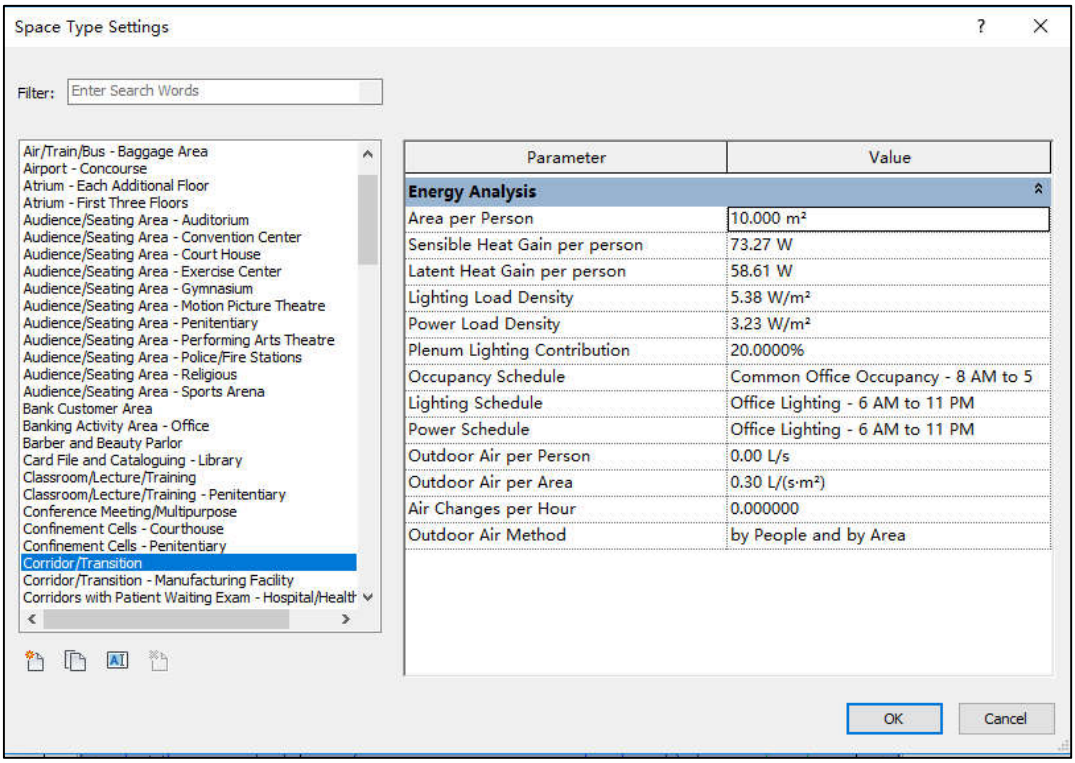


Figure- 47. Manage thermal conditions in space setting

For the export settings, the export category and complexity must be noted or will lead to export errors. With the correct settings as showing in Figure-48, the geometry, zone, material, schedules, and load factors could be exported to the target format

entirely in different ways. But unfortunately, the HVAC equipment and parameters were not successfully exported.

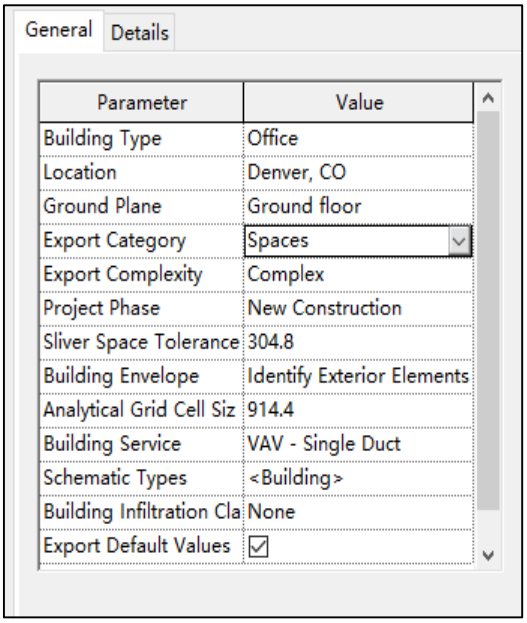


Figure- 48. Exporting settings in Revit

The whole exporting process and methods were summarized as Figure-49.

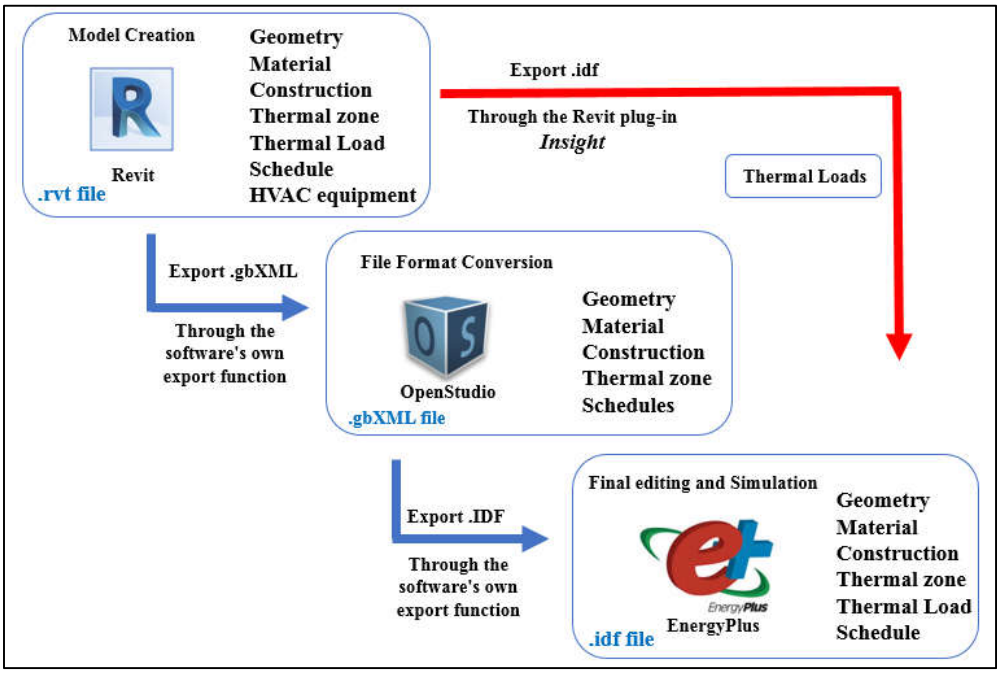


Figure- 49. Exporting process and methods (Revit→gbXML & IDF)

Chapter 4. BIM-based FPT information transmission process

4.1. Parameter entry sheet

Based on previous findings, the BIM-based FPT information transmission process was summarized as a parameter entry sheet as showing in Tabel-10. Through this method, the Cx team and could get involved during the early model making phase, request the model builder to enter some parameters that could be well exported, and use its directly for simulation or maintenance. Thereby saving the time and labor cost of information re-entering and re-modeling, avoid possible information transfer errors due to information island, and simplify the process as well.

4.2. Validation

As the examination, a BIM model combined with the information come from 2D drawing and BEMS data of the survey area was built and exported to EnergyPlus for simulation according to the sheet, then compared the results with actual BEMS data.

The location, shape, and deflection angles were reference from Google Earth. The window was used instead of the glass curtain façade. Due to the BEMS data is provided by region, and the interior and perimeter zone division requirement for simulation, 2 interior and 2 perimeter zones were created, and 4 VAV systems were added into each zone as showing in Figure-51. Air walls were created as the zone separation, and the wall material was set to Air. The whole view of the model is shown in Figure-52.

Table- 10. Parameter entry sheet

Category	Parameter	Entry Method	Export Method
Project	Project name	R	Insight
	Location	R	Insight
	Run Period	EP	
	Weather	EP	
Geometry	Simulation Area	R	R-OS-EP
	Surrounding Buildings	R	R-OS-EP
Material& Construction	Wall, Roof, Floor, Window	R	R-OS-EP
	Furniture	EP	
	Blind	EP	
Zone	1I	R	R-OS-EP
	1P	R	R-OS-EP
	2I	R	R-OS-EP
	2P	R	R-OS-EP
Internal Gains	Power	R	Insight
	Lighting	R	Insight
	People	R	Insight
Zone Setpoint	Cooling Setpoint	EP	
	Heating Setpoint	EP	
Schedule	VAV Operation	EP	
	Power	R	R-OS-EP
	Lighting	R	R-OS-EP
	Occupancy	R	R-OS-EP
	Blind	EP	
	People Activity	EP	
	Infiltration	EP	
Infiltration	Factor	EP	
VAV	Whole system	EP	
Chiller	Whole system	EP	
Tower	Whole system	EP	
WaterLoop	Whole system	EP	

R: Revit; OS: OpenStuido; EP: EnergyPlus

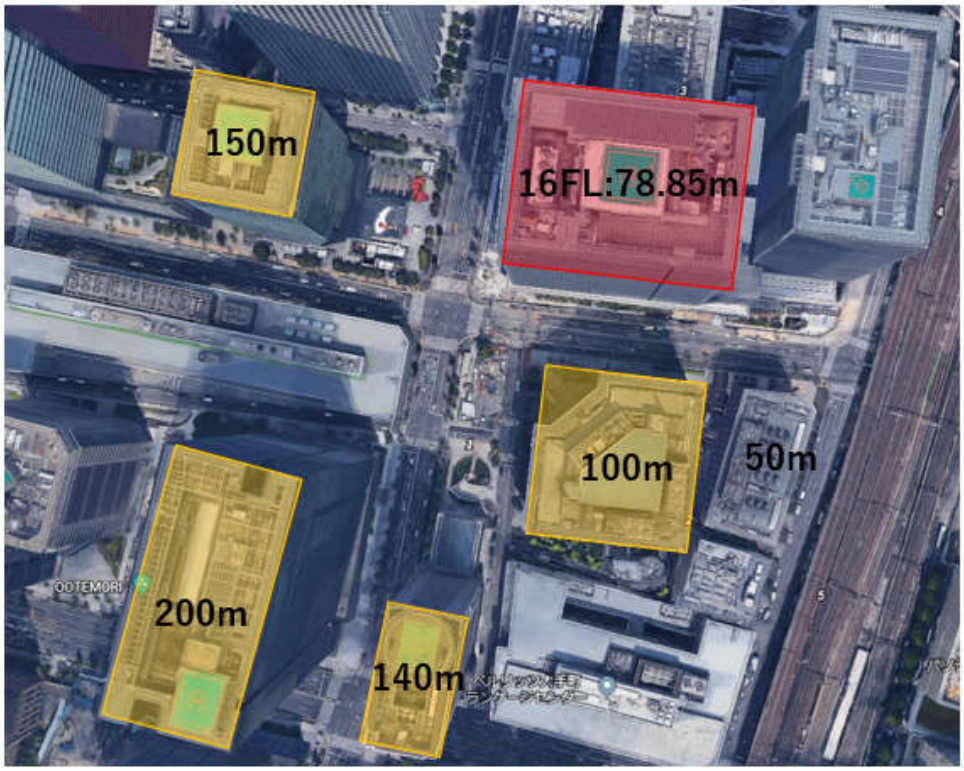


Figure- 50. Target building and surrounding shadings

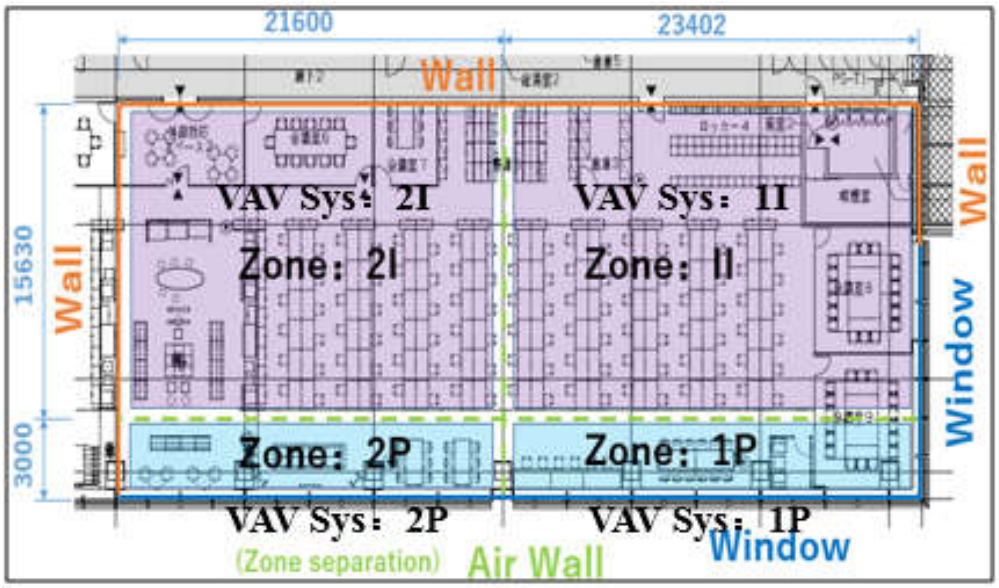


Figure- 51. Zone separation and VAV setting in the model

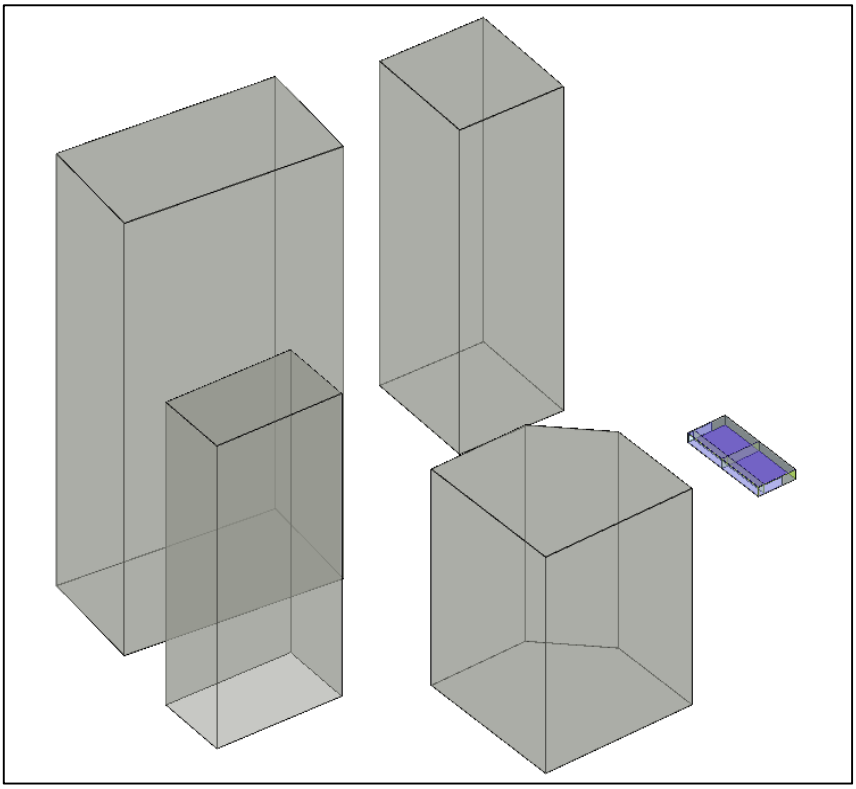


Figure- 52. Whole model view in Revit

The parameters and entry method are showing in Figure-53. Due to the actual materials were unknown, the materials from EP database and Revit database were used. In the basic case, the conductivity (K value) of envelop material was set to 0.0001. To investigate the effect of the material on the results, a different envelop material case (K= 0.02) and a different window material case was built as comparisons. The load factors and schedules were references from the actual BEMS data. The infiltration factor was calculated from the nighttime decay CO2 concentration. Part of the zone cooling settings have come from 2D drawing, the other unknown parameters were set as EnergyPlus default value. The weather data was self-made EPW file of the period 2018/09/01-10/12, reference from Japan Meteorological Agency.

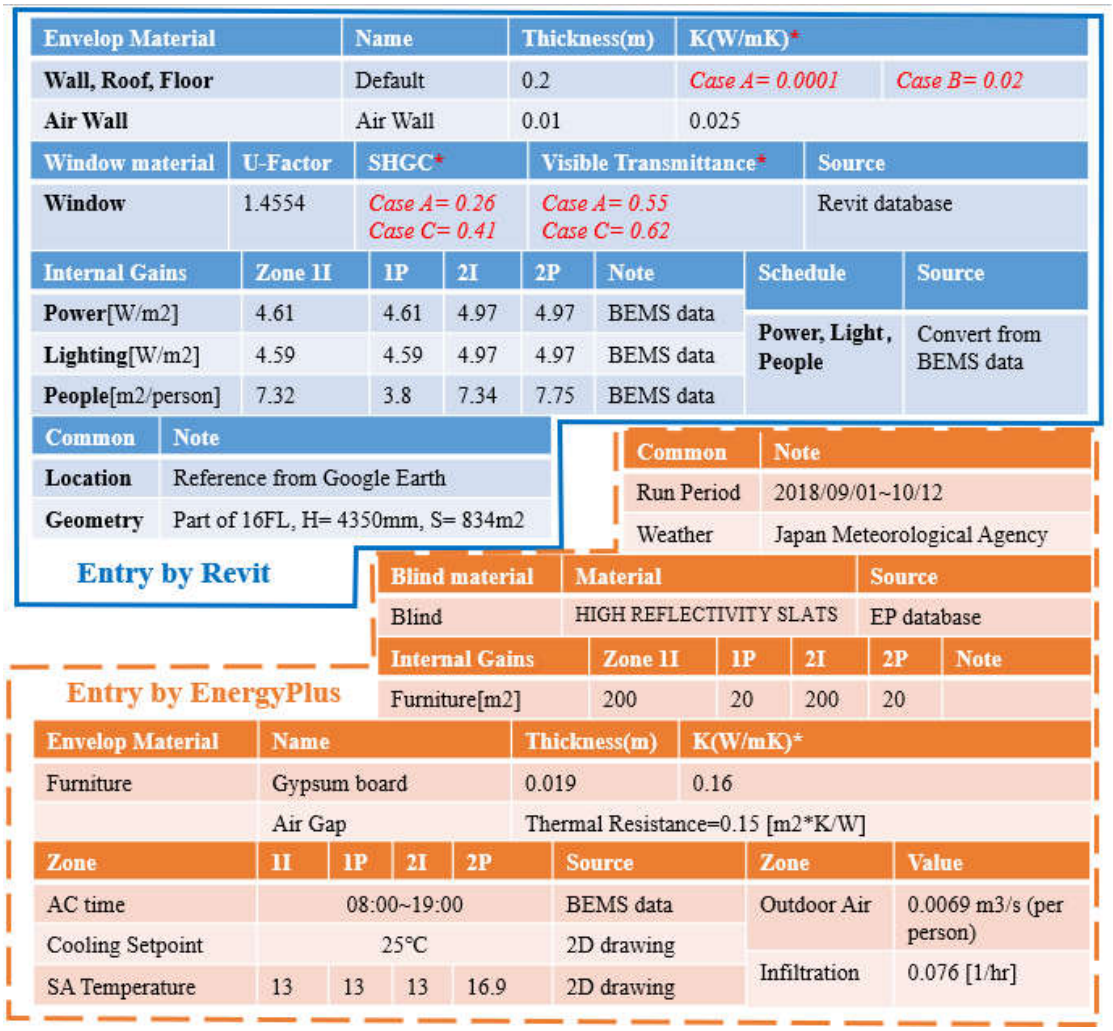


Figure- 53. Examine model input parameters

Due to the limited content of BEMS data received from the building operator, the zone temperature and AC cold water energy usage were used for comparisons. The results and comparisons in 2018/10/01 as the example are showing in Figure-54 and Figure-55. According to the fluctuation of actual zone temperature, the day is divided into three periods that 8~10:00, 11~14:00, and 15~19:00. The coefficient of variation for cold water energy usage of different material settings in each period is shown in the Figure-55.

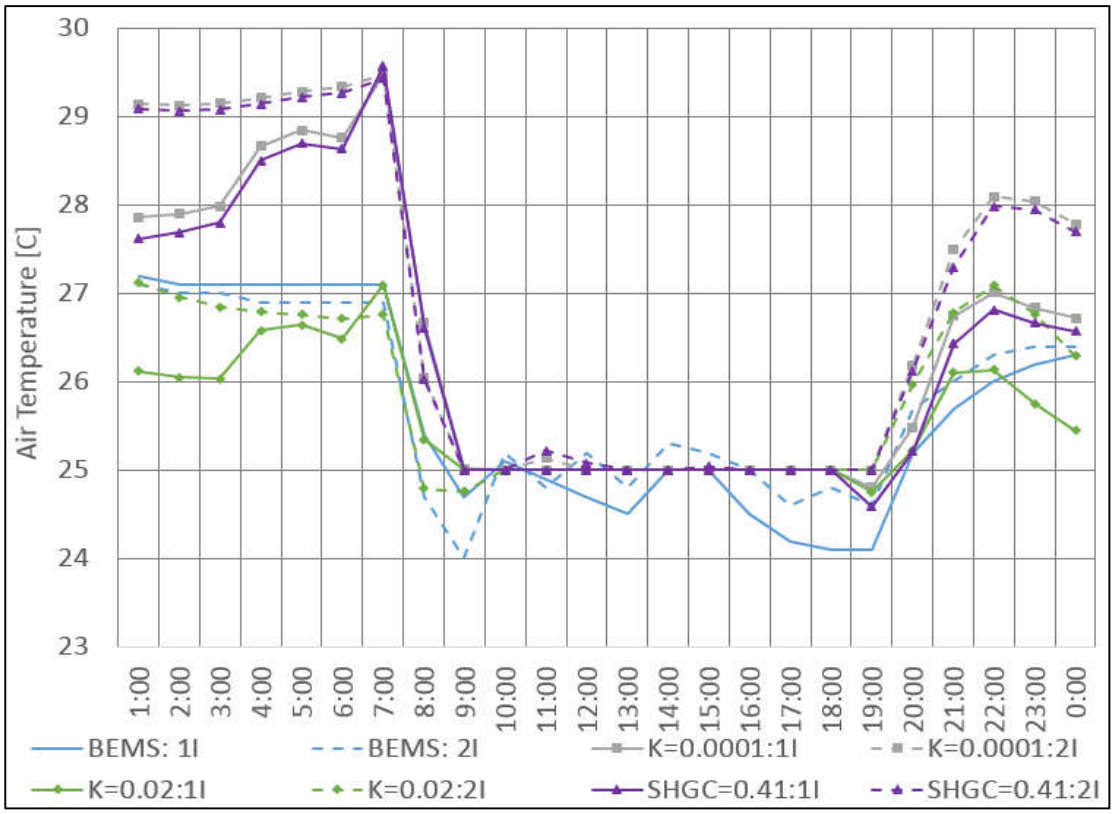
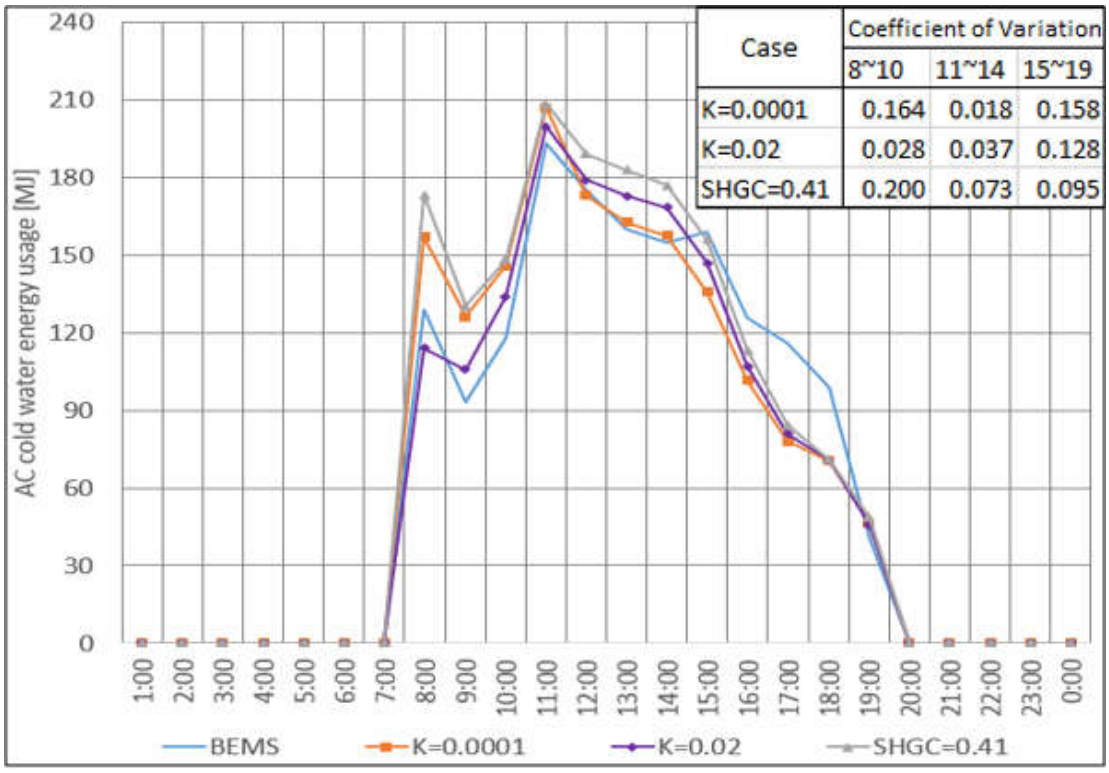


Figure- 54. Comparison of zone temperature



Case	Coefficient of Variation		
	8~10	11~14	15~19
K=0.0001	0.164	0.018	0.158
K=0.02	0.028	0.037	0.128
SHGC=0.41	0.200	0.073	0.095

Figure- 55. Comparison of AC cold water energy usage

As the results, the proposed method presents good accuracy results. Simulation process has high sensitivity toward great number of parameters such as materials' properties. Some variation between simulated results and actual one because of lack of few data and estimated setting. More detailed data can increase the accuracy of obtained results. The information is presumed not easy to collect for the Cx team just like this study. If correct parameters, not only the material but also other values were set to default in this case, could be entered into the BIM model at the model making stage, the results are expected to be closer to the actual, and beneficial for other subsequent uses.

Chapter 5. Conclusions

5.1. Achievement of Research Objectives

The benefits of adopt Cx-FPT, barriers for its universalization, and the feasible improvement solutions were identified through the reviewing previous empirical studies. Through effective Cx process, the energy waste could reduce up to 20%. But the extract of information is hindering the speared. If the advantage of BIM in information sharing could be investigate with Cx, it is expected to improve the efficiency. And the insufficient of BIM-based Cx-FPT research is also found.

The actual air conditioning system operation states and the thermal comfort in the target building was confirmed through survey and BEMS data analyze. The temperature of each representative point changed very frequently, rise or fall by about 1~2 degrees every half hour during the operation period. The temperature of AO1 also in flux. The results show that the cold water energy consumption of air conditioning system accounts for the vast majority of energy consumption every day, and its significantly affected by the outdoor temperature of the day. The actual indoor environment and the inappropriate in the operation of the air conditioning system of the target building were initially understand, provide a basis for future detailed detection.

The first case study shows how proposed method deals with FPT parameters which are used in BIM model. The expressibility of FPT required parameters in the BIM model was determined. The relevant parameters belonging to the object itself were well performed in the BIM model. The air temperature and humidity set point of each zone can be set in the zone setting, but the demand for indoor and outdoor air conditions was not expressed as expected.

The transferability of related components and parameters between BIM mode and Excel/gbXML/IDF format were identified through the second case study. For Excel, with proper settings, almost all parameters in HVAC object could be exported to an Excel file. With the correct settings, the geometry, zone, material, schedules, and load factors could be exported to gbXML or IDF in different ways. But unfortunately, the HVAC equipment and parameters were not successfully exported. Important considerations and required settings have been pointed out.

A BIM-based FPT information transmission process was proposed, and the efficacy and usefulness were discussed by the examination. Through this method, the Cx team and could get involved during the early model making phase, request the model builder to enter some parameters that could be well exported, and use its directly for simulation Thereby saving the time and labor cost of information re-entering and re-modeling, avoid possible information transfer errors due to information island, and simplify the process as well.

5.2. Limitations

This research naturally has its limitations. First, the actual measurement was carried out only in the end of September and the beginning of October, only the operation state and indoor environment of refrigeration period were investigated. The actual situation in winter was not investigated. And the survey is mainly focusing on indoor environment, to know more about the refrigerator system actual operation state, more investigate according to the Cx and FPT manual are necessary.

Due to the lack of design data (such as material information), the incompleteness of the BEMS data (e.g. without the outdoor air amount of the VAV system and blind schedule, people schedule estimate by BEMS data), many speculative values were used.

And the model contains only a portion of the 16 floor, which has an impact on the results of the simulation calculations.

5.3. Recommendations for future research

This study has laid the foundation of investigating the BIM in the Cx-FPT process. Based on the identified limitations illustrated in the former section, a few recommendations are given to give implications for future research following the footsteps of this study.

First, it is necessary to adopt more measurement in heating period, and investigate more required operation states of measure points according to the Cx and FPT manual.

Second, if correct values, not only the material but also other parameters could be entered to the BIM model at the early making stage by designer who know them well, the simulation results are expected to be closer to the actual, and beneficial for other subsequent uses.

Finally, in the future, if the export function of software could be further strengthened, or plug-in could be added to model builder through secondary development, so that more parameters can be directly exported, more and more parameters can be input through the R method in entry sheet, and directly export to target format, which further reduces the parameters of simulation model construction. Work load of re-entry can simplify process, improve efficiency, promote the popularization of Cx and better solve EPG problems.

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Appendix

Simulation parameter of Validation model

Case A (K=0.0001):

!-Generator IDFEditor 1.50
!-Option OriginalOrderTop UseSpecialFormat

!-NOTE: All comments with '!-' are ignored by the IDFEditor and are generated automatically.
!- Use '!' comments if they need to be retained when using the IDFEditor.

Schedule:Day:Interval,
JP_Occ1, !- Name
Fraction, !- Schedule Type Limits Name
No, !- Interpolate to Timestep
01:00, !- Time 1 {hh:mm}
0, !- Value Until Time 1
02:00, !- Time 2 {hh:mm}
0, !- Value Until Time 2
03:00, !- Time 3 {hh:mm}
0, !- Value Until Time 3
04:00, !- Time 4 {hh:mm}
0, !- Value Until Time 4
05:00, !- Time 5 {hh:mm}
0, !- Value Until Time 5
06:00, !- Time 6 {hh:mm}
0, !- Value Until Time 6
07:00, !- Time 7 {hh:mm}
0, !- Value Until Time 7
08:00, !- Time 8 {hh:mm}
0, !- Value Until Time 8
09:00, !- Time 9 {hh:mm}
0, !- Value Until Time 9
10:00, !- Time 10 {hh:mm}
0.28, !- Value Until Time 10
11:00, !- Time 11 {hh:mm}
0.7, !- Value Until Time 11
12:00, !- Time 12 {hh:mm}
0, !- Value Until Time 12
13:00, !- Time 13 {hh:mm}
0.28, !- Value Until Time 13
14:00, !- Time 14 {hh:mm}

```
    0,                      !- Value Until Time 14
    15:00,                  !- Time 15 {hh:mm}
    0.9,                    !- Value Until Time 15
    16:00,                  !- Time 16 {hh:mm}
    0.9,                    !- Value Until Time 16
    17:00,                  !- Time 17 {hh:mm}
    0.9,                    !- Value Until Time 17
    18:00,                  !- Time 18 {hh:mm}
    0.9,                    !- Value Until Time 18
    19:00,                  !- Time 19 {hh:mm}
    0.28,                   !- Value Until Time 19
    20:00,                  !- Time 20 {hh:mm}
    0,                      !- Value Until Time 20
    21:00,                  !- Time 21 {hh:mm}
    0.1,                    !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0,                      !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0,                      !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0;                      !- Value Until Time 24

Schedule:Day:Interval,
    JP_Occ2,                !- Name
    Fraction,               !- Schedule Type Limits Name
    No,                     !- Interpolate to Timestep
    01:00,                  !- Time 1 {hh:mm}
    0,                      !- Value Until Time 1
    02:00,                  !- Time 2 {hh:mm}
    0,                      !- Value Until Time 2
    03:00,                  !- Time 3 {hh:mm}
    0,                      !- Value Until Time 3
    04:00,                  !- Time 4 {hh:mm}
    0,                      !- Value Until Time 4
    05:00,                  !- Time 5 {hh:mm}
    0,                      !- Value Until Time 5
    06:00,                  !- Time 6 {hh:mm}
    0,                      !- Value Until Time 6
    07:00,                  !- Time 7 {hh:mm}
    0,                      !- Value Until Time 7
    08:00,                  !- Time 8 {hh:mm}
    0,                      !- Value Until Time 8
    09:00,                  !- Time 9 {hh:mm}
```

```
    0,                      !- Value Until Time 9
    10:00,                  !- Time 10 {hh:mm}
    0.2,                    !- Value Until Time 10
    11:00,                  !- Time 11 {hh:mm}
    0.7,                    !- Value Until Time 11
    12:00,                  !- Time 12 {hh:mm}
    0.5,                    !- Value Until Time 12
    13:00,                  !- Time 13 {hh:mm}
    0.5,                    !- Value Until Time 13
    14:00,                  !- Time 14 {hh:mm}
    0,                      !- Value Until Time 14
    15:00,                  !- Time 15 {hh:mm}
    0.9,                    !- Value Until Time 15
    16:00,                  !- Time 16 {hh:mm}
    0.9,                    !- Value Until Time 16
    17:00,                  !- Time 17 {hh:mm}
    0.9,                    !- Value Until Time 17
    18:00,                  !- Time 18 {hh:mm}
    0.9,                    !- Value Until Time 18
    19:00,                  !- Time 19 {hh:mm}
    0.5,                    !- Value Until Time 19
    20:00,                  !- Time 20 {hh:mm}
    0.2,                    !- Value Until Time 20
    21:00,                  !- Time 21 {hh:mm}
    0.1,                    !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0,                      !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0,                      !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0;                      !- Value Until Time 24

Schedule:Compact,
    VAV 1P,                 !- Name
    Control Type,           !- Schedule Type Limits Name
    Through: 12/31,         !- Field 1
    For: AllDays,           !- Field 2
    Until: 7:00, 0.0,       !- Field 4
    Until: 19:00, 4,        !- Field 6
    Until: 24:00, 0;        !- Field 8

Schedule:Compact,
    VAV 2P,                 !- Name
```

Control Type, *!- Schedule Type Limits Name*
Through: 12/31, *!- Field 1*
For: AllDays, *!- Field 2*
Until: 10:00, 0.0, *!- Field 4*
Until: 19:00, 4, *!- Field 6*
Until: 24:00, 0; *!- Field 8*

Schedule:Week:Daily,
Schedule:Week:Daily {a563f476-0467-438c-b2d6-56fd52dfe64a}, *!- Name*
Medium Office ClgSetp Rule 1 Day Schedule, *!- Sunday Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- Monday Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- Tuesday Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- Wednesday Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- Thursday Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- Friday Schedule:Day Name*
Medium Office ClgSetp Rule 1 Day Schedule, *!- Saturday Schedule:Day Name*
Medium Office ClgSetp Rule 1 Day Schedule, *!- Holiday Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- SummerDesignDay Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- WinterDesignDay Schedule:Day Name*
Medium Office ClgSetp Default Schedule, *!- CustomDay1 Schedule:Day Name*
Medium Office ClgSetp Default Schedule; *!- CustomDay2 Schedule:Day Name*

Schedule:Day:Interval,
JP_Equ1, *!- Name*
Fraction, *!- Schedule Type Limits Name*
No, *!- Interpolate to Timestep*
01:00, *!- Time 1 {hh:mm}*
0.4, *!- Value Until Time 1*
02:00, *!- Time 2 {hh:mm}*
0.4, *!- Value Until Time 2*
03:00, *!- Time 3 {hh:mm}*
0.4, *!- Value Until Time 3*
04:00, *!- Time 4 {hh:mm}*
1, *!- Value Until Time 4*
05:00, *!- Time 5 {hh:mm}*
0.4, *!- Value Until Time 5*
06:00, *!- Time 6 {hh:mm}*
0.4, *!- Value Until Time 6*
07:00, *!- Time 7 {hh:mm}*
0.4, *!- Value Until Time 7*
08:00, *!- Time 8 {hh:mm}*
0, *!- Value Until Time 8*
09:00, *!- Time 9 {hh:mm}*

```
    0,                      !- Value Until Time 9
    10:00,                  !- Time 10 {hh:mm}
    0.4,                    !- Value Until Time 10
    11:00,                  !- Time 11 {hh:mm}
    1,                      !- Value Until Time 11
    12:00,                  !- Time 12 {hh:mm}
    0,                      !- Value Until Time 12
    13:00,                  !- Time 13 {hh:mm}
    0.4,                    !- Value Until Time 13
    14:00,                  !- Time 14 {hh:mm}
    1,                      !- Value Until Time 14
    15:00,                  !- Time 15 {hh:mm}
    0,                      !- Value Until Time 15
    16:00,                  !- Time 16 {hh:mm}
    1,                      !- Value Until Time 16
    17:00,                  !- Time 17 {hh:mm}
    0.4,                    !- Value Until Time 17
    18:00,                  !- Time 18 {hh:mm}
    0.4,                    !- Value Until Time 18
    19:00,                  !- Time 19 {hh:mm}
    0.4,                    !- Value Until Time 19
    20:00,                  !- Time 20 {hh:mm}
    0,                      !- Value Until Time 20
    21:00,                  !- Time 21 {hh:mm}
    0.4,                    !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0,                      !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0,                      !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0.4;                    !- Value Until Time 24

Schedule:Day:Interval,
    JP_Equ2,                !- Name
    Fraction,               !- Schedule Type Limits Name
    No,                     !- Interpolate to Timestep
    01:00,                  !- Time 1 {hh:mm}
    0.286,                  !- Value Until Time 1
    02:00,                  !- Time 2 {hh:mm}
    0.286,                  !- Value Until Time 2
    03:00,                  !- Time 3 {hh:mm}
    0.286,                  !- Value Until Time 3
    04:00,                  !- Time 4 {hh:mm}
```

0.286, *!- Value Until Time 4*
05:00, *!- Time 5 {hh:mm}*
0.286, *!- Value Until Time 5*
06:00, *!- Time 6 {hh:mm}*
0.286, *!- Value Until Time 6*
07:00, *!- Time 7 {hh:mm}*
0.286, *!- Value Until Time 7*
08:00, *!- Time 8 {hh:mm}*
0, *!- Value Until Time 8*
09:00, *!- Time 9 {hh:mm}*
0.714, *!- Value Until Time 9*
10:00, *!- Time 10 {hh:mm}*
0.286, *!- Value Until Time 10*
11:00, *!- Time 11 {hh:mm}*
1, *!- Value Until Time 11*
12:00, *!- Time 12 {hh:mm}*
0.714, *!- Value Until Time 12*
13:00, *!- Time 13 {hh:mm}*
0.714, *!- Value Until Time 13*
14:00, *!- Time 14 {hh:mm}*
0.714, *!- Value Until Time 14*
15:00, *!- Time 15 {hh:mm}*
0.286, *!- Value Until Time 15*
16:00, *!- Time 16 {hh:mm}*
1, *!- Value Until Time 16*
17:00, *!- Time 17 {hh:mm}*
0.714, *!- Value Until Time 17*
18:00, *!- Time 18 {hh:mm}*
0.714, *!- Value Until Time 18*
19:00, *!- Time 19 {hh:mm}*
0.714, *!- Value Until Time 19*
20:00, *!- Time 20 {hh:mm}*
0.286, *!- Value Until Time 20*
21:00, *!- Time 21 {hh:mm}*
0.286, *!- Value Until Time 21*
22:00, *!- Time 22 {hh:mm}*
0.286, *!- Value Until Time 22*
23:00, *!- Time 23 {hh:mm}*
0.286, *!- Value Until Time 23*
24:00, *!- Time 24 {hh:mm}*
0; *!- Value Until Time 24*

Schedule:Day:Hourly,

```
    VAV Control,              !- Name
    Control Type,             !- Schedule Type Limits Name
    0,                        !- Hour 1
    0,                        !- Hour 2
    0,                        !- Hour 3
    0,                        !- Hour 4
    0,                        !- Hour 5
    0,                        !- Hour 6
    0,                        !- Hour 7
    1,                        !- Hour 8
    1,                        !- Hour 9
    1,                        !- Hour 10
    1,                        !- Hour 11
    1,                        !- Hour 12
    1,                        !- Hour 13
    1,                        !- Hour 14
    1,                        !- Hour 15
    1,                        !- Hour 16
    1,                        !- Hour 17
    1,                        !- Hour 18
    1,                        !- Hour 19
    0,                        !- Hour 20
    0,                        !- Hour 21
    0,                        !- Hour 22
    0,                        !- Hour 23
    0;                        !- Hour 24

Schedule:Day:Hourly,
    Control Type All Days,    !- Name
    Control Type,             !- Schedule Type Limits Name
    0,                        !- Hour 1
    0,                        !- Hour 2
    0,                        !- Hour 3
    0,                        !- Hour 4
    0,                        !- Hour 5
    0,                        !- Hour 6
    0,                        !- Hour 7
    4,                        !- Hour 8
    4,                        !- Hour 9
    4,                        !- Hour 10
    4,                        !- Hour 11
    4,                        !- Hour 12
    4,                        !- Hour 13
```

```
    4,                      !- Hour 14
    4,                      !- Hour 15
    4,                      !- Hour 16
    4,                      !- Hour 17
    4,                      !- Hour 18
    4,                      !- Hour 19
    0,                      !- Hour 20
    0,                      !- Hour 21
    0,                      !- Hour 22
    0,                      !- Hour 23
    0;                      !- Hour 24

Schedule:Day:Hourly,
    Zone Cooling Setpoint All Days,    !- Name
    Temperature,            !- Schedule Type Limits Name
    27,                     !- Hour 1
    27,                     !- Hour 2
    27,                     !- Hour 3
    27,                     !- Hour 4
    27,                     !- Hour 5
    27,                     !- Hour 6
    27,                     !- Hour 7
    25,                     !- Hour 8
    25,                     !- Hour 9
    25,                     !- Hour 10
    25,                     !- Hour 11
    25,                     !- Hour 12
    25,                     !- Hour 13
    25,                     !- Hour 14
    25,                     !- Hour 15
    25,                     !- Hour 16
    25,                     !- Hour 17
    25,                     !- Hour 18
    25,                     !- Hour 19
    27,                     !- Hour 20
    27,                     !- Hour 21
    27,                     !- Hour 22
    27,                     !- Hour 23
    27;                     !- Hour 24

WindowMaterial:SimpleGlazingSystem,
    {80b6c737-a4c9-4631-aea7-88a7a92b5b96},    !- Name
    1.4554,                 !- U-Factor {W/m2-K}
```

```
    0.26,                   !- Solar Heat Gain Coefficient
    0.55;                   !- Visible Transmittance

Shading:Building:Detailed,
    X-S-44,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -147.3052, -182.631, 140.2,         !- X,Y,Z  1 {m}
    -113.0339, -188.6739, 140.2,        !- X,Y,Z  2 {m}
    -102.6498, -129.7824, 140.2,        !- X,Y,Z  3 {m}
    -136.9211, -123.7394, 140.2;        !- X,Y,Z  4 {m}

SimulationControl,
    Yes,                    !- Do Zone Sizing Calculation
    Yes,                    !- Do System Sizing Calculation
    No,                     !- Do Plant Sizing Calculation
    Yes,                    !- Run Simulation for Sizing Periods
    Yes;                    !- Run Simulation for Weather File Run Periods

Building,
    JP_Building,            !- Name
    ,                       !- North Axis {deg}
    City,                   !- Terrain
    0.04,                   !- Loads Convergence Tolerance Value
    0.4,                    !- Temperature Convergence Tolerance Value {deltaC}
    FullInteriorAndExteriorWithReflections,   !- Solar Distribution
    ,                       !- Maximum Number of Warmup Days
    ;                       !- Minimum Number of Warmup Days

Site:Location,
    JP,                     !- Name
    35.687,                 !- Latitude {deg}
    139.767,                !- Longitude {deg}
    9.0,                    !- Time Zone {hr}
    5;                      !- Elevation {m}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Htg 99.6% Condns DB,   !- Name
    1,                      !- Month
    21,                     !- Day of Month
    WinterDesignDay,        !- Day Type
    -6.9,                   !- Maximum Dry-Bulb Temperature {C}
    0.0,                    !- Daily Dry-Bulb Temperature Range {deltaC}
```

```
    DefaultMultipliers,       !- Dry-Bulb Temperature Range Modifier Type
    ,                         !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                  !- Humidity Condition Type
    -6.9,                     !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    1.1,                      !- Wind Speed {m/s}
    0,                        !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
    ASHRAEClearSky,           !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    ,                         !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    ,                         !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}
    0.00;                     !- Sky Clearness

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Htg 99% Condns DB,    !- Name
    1,                        !- Month
    21,                       !- Day of Month
    WinterDesignDay,          !- Day Type
    -5.1,                     !- Maximum Dry-Bulb Temperature {C}
    0.0,                      !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,       !- Dry-Bulb Temperature Range Modifier Type
    ,                         !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                  !- Humidity Condition Type
    -5.1,                     !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    1.1,                      !- Wind Speed {m/s}
    0,                        !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
```

```
    ASHRAEClearSky,           !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    ,                         !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    ,                         !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}
    0.00;                     !- Sky Clearness

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Hum_n 99.6% Condns DP=>MCDB,    !- Name
    1,                        !- Month
    21,                       !- Day of Month
    WinterDesignDay,          !- Day Type
    1,                        !- Maximum Dry-Bulb Temperature {C}
    0.0,                      !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,       !- Dry-Bulb Temperature Range Modifier Type
    ,                         !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Dewpoint,                 !- Humidity Condition Type
    -12.8,                    !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    1.1,                      !- Wind Speed {m/s}
    0,                        !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
    ASHRAEClearSky,           !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    ,                         !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    ,                         !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}
    0.00;                     !- Sky Clearness

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Hum_n 99% Condns DP=>MCDB,    !- Name
    1,                        !- Month
    21,                       !- Day of Month
    WinterDesignDay,          !- Day Type
    0.6,                      !- Maximum Dry-Bulb Temperature {C}
```

```
    0.0,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Dewpoint,               !- Humidity Condition Type
    -11.1,                  !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                       !- Humidity Condition Day Schedule Name
    ,                       !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                       !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                       !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                !- Barometric Pressure {Pa}
    1.1,                    !- Wind Speed {m/s}
    0,                      !- Wind Direction {deg}
    No,                     !- Rain Indicator
    No,                     !- Snow Indicator
    No,                     !- Daylight Saving Time Indicator
    ASHRAEClearSky,         !- Solar Model Indicator
    ,                       !- Beam Solar Day Schedule Name
    ,                       !- Diffuse Solar Day Schedule Name
    ,                       !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    ,                       !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}
    0.00;                   !- Sky Clearness

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Htg Wind 99.6% Condns WS=>MCDB,    !- Name
    1,                      !- Month
    21,                     !- Day of Month
    WinterDesignDay,        !- Day Type
    6.1,                    !- Maximum Dry-Bulb Temperature {C}
    0.0,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                !- Humidity Condition Type
    6.1,                    !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                       !- Humidity Condition Day Schedule Name
    ,                       !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                       !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                       !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                !- Barometric Pressure {Pa}
    10.2,                   !- Wind Speed {m/s}
    0,                      !- Wind Direction {deg}
    No,                     !- Rain Indicator
    No,                     !- Snow Indicator
```

```
    No,                       !- Daylight Saving Time Indicator
    ASHRAEClearSky,           !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    ,                         !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    ,                         !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}
    0.00;                     !- Sky Clearness

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Htg Wind 99% Condns WS=>MCDB,    !- Name
    1,                        !- Month
    21,                       !- Day of Month
    WinterDesignDay,          !- Day Type
    6.6,                      !- Maximum Dry-Bulb Temperature {C}
    0.0,                      !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,       !- Dry-Bulb Temperature Range Modifier Type
    ,                         !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                  !- Humidity Condition Type
    6.6,                      !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    8.7,                      !- Wind Speed {m/s}
    0,                        !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
    ASHRAEClearSky,           !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    ,                         !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    ,                         !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}
    0.00;                     !- Sky Clearness

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg .4% Condns DB=>MWB,    !- Name
    8,                        !- Month
    21,                       !- Day of Month
    SummerDesignDay,          !- Day Type
```

```
    32.1,                    !- Maximum Dry-Bulb Temperature {C}
    7.7,                     !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,      !- Dry-Bulb Temperature Range Modifier Type
    ,                        !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                 !- Humidity Condition Type
    26,                      !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                        !- Humidity Condition Day Schedule Name
    ,                        !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                        !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                        !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                 !- Barometric Pressure {Pa}
    4.8,                     !- Wind Speed {m/s}
    210,                     !- Wind Direction {deg}
    No,                      !- Rain Indicator
    No,                      !- Snow Indicator
    No,                      !- Daylight Saving Time Indicator
    ASHRAETau,               !- Solar Model Indicator
    ,                        !- Beam Solar Day Schedule Name
    ,                        !- Diffuse Solar Day Schedule Name
    0.546,                   !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                   !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 1% Condns DB=>MWB,    !- Name
    8,                       !- Month
    21,                      !- Day of Month
    SummerDesignDay,         !- Day Type
    30.9,                    !- Maximum Dry-Bulb Temperature {C}
    7.7,                     !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,      !- Dry-Bulb Temperature Range Modifier Type
    ,                        !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                 !- Humidity Condition Type
    25.8,                    !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                        !- Humidity Condition Day Schedule Name
    ,                        !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                        !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                        !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                 !- Barometric Pressure {Pa}
    4.8,                     !- Wind Speed {m/s}
    210,                     !- Wind Direction {deg}
    No,                      !- Rain Indicator
    No,                      !- Snow Indicator
```

```
    No,                       !- Daylight Saving Time Indicator
    ASHRAETau,                !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    0.546,                    !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                    !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 2% Condns DB=>MWB,    !- Name
    8,                        !- Month
    21,                       !- Day of Month
    SummerDesignDay,          !- Day Type
    29.2,                     !- Maximum Dry-Bulb Temperature {C}
    7.7,                      !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,       !- Dry-Bulb Temperature Range Modifier Type
    ,                         !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                  !- Humidity Condition Type
    24.8,                     !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    4.8,                      !- Wind Speed {m/s}
    210,                      !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
    ASHRAETau,                !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    0.546,                    !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                    !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg .4% Condns WB=>MDB,    !- Name
    8,                        !- Month
    21,                       !- Day of Month
    SummerDesignDay,          !- Day Type
    30.6,                     !- Maximum Dry-Bulb Temperature {C}
    7.7,                      !- Daily Dry-Bulb Temperature Range {deltaC}
```

```
    DefaultMultipliers,      !- Dry-Bulb Temperature Range Modifier Type
    ,                        !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                 !- Humidity Condition Type
    26.8,                    !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                        !- Humidity Condition Day Schedule Name
    ,                        !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                        !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                        !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                 !- Barometric Pressure {Pa}
    4.8,                     !- Wind Speed {m/s}
    210,                     !- Wind Direction {deg}
    No,                      !- Rain Indicator
    No,                      !- Snow Indicator
    No,                      !- Daylight Saving Time Indicator
    ASHRAETau,               !- Solar Model Indicator
    ,                        !- Beam Solar Day Schedule Name
    ,                        !- Diffuse Solar Day Schedule Name
    0.546,                   !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub) {dimensionless}
    1.827;                   !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance (taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 1% Condns WB=>MDB,    !- Name
    8,                       !- Month
    21,                      !- Day of Month
    SummerDesignDay,         !- Day Type
    29.6,                    !- Maximum Dry-Bulb Temperature {C}
    7.7,                     !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,      !- Dry-Bulb Temperature Range Modifier Type
    ,                        !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                 !- Humidity Condition Type
    26.1,                    !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                        !- Humidity Condition Day Schedule Name
    ,                        !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                        !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                        !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                 !- Barometric Pressure {Pa}
    4.8,                     !- Wind Speed {m/s}
    210,                     !- Wind Direction {deg}
    No,                      !- Rain Indicator
    No,                      !- Snow Indicator
    No,                      !- Daylight Saving Time Indicator
    ASHRAETau,               !- Solar Model Indicator
```

```
    ,                       !- Beam Solar Day Schedule Name
    ,                       !- Diffuse Solar Day Schedule Name
    0.546,                  !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                  !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 2% Condns WB=>MDB,    !- Name
    8,                      !- Month
    21,                     !- Day of Month
    SummerDesignDay,        !- Day Type
    28.7,                   !- Maximum Dry-Bulb Temperature {C}
    7.7,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Wetbulb,                !- Humidity Condition Type
    25.5,                   !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                       !- Humidity Condition Day Schedule Name
    ,                       !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                       !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                       !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                !- Barometric Pressure {Pa}
    4.8,                    !- Wind Speed {m/s}
    210,                    !- Wind Direction {deg}
    No,                     !- Rain Indicator
    No,                     !- Snow Indicator
    No,                     !- Daylight Saving Time Indicator
    ASHRAETau,              !- Solar Model Indicator
    ,                       !- Beam Solar Day Schedule Name
    ,                       !- Diffuse Solar Day Schedule Name
    0.546,                  !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                  !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg .4% Condns DP=>MDB,    !- Name
    8,                      !- Month
    21,                     !- Day of Month
    SummerDesignDay,        !- Day Type
    29.3,                   !- Maximum Dry-Bulb Temperature {C}
    7.7,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
```

```
    Dewpoint,                 !- Humidity Condition Type
    26,                       !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    4.8,                      !- Wind Speed {m/s}
    210,                      !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
    ASHRAETau,                !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
    0.546,                    !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                    !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 1% Condns DP=>MDB,    !- Name
    8,                        !- Month
    21,                       !- Day of Month
    SummerDesignDay,          !- Day Type
    28.3,                     !- Maximum Dry-Bulb Temperature {C}
    7.7,                      !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,       !- Dry-Bulb Temperature Range Modifier Type
    ,                         !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Dewpoint,                 !- Humidity Condition Type
    25.1,                     !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                         !- Humidity Condition Day Schedule Name
    ,                         !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                         !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                         !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                  !- Barometric Pressure {Pa}
    4.8,                      !- Wind Speed {m/s}
    210,                      !- Wind Direction {deg}
    No,                       !- Rain Indicator
    No,                       !- Snow Indicator
    No,                       !- Daylight Saving Time Indicator
    ASHRAETau,                !- Solar Model Indicator
    ,                         !- Beam Solar Day Schedule Name
    ,                         !- Diffuse Solar Day Schedule Name
```

```
    0.546,                  !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                  !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 2% Condns DP=>MDB,    !- Name
    8,                      !- Month
    21,                     !- Day of Month
    SummerDesignDay,        !- Day Type
    27.1,                   !- Maximum Dry-Bulb Temperature {C}
    7.7,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Dewpoint,               !- Humidity Condition Type
    24.2,                   !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                       !- Humidity Condition Day Schedule Name
    ,                       !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    ,                       !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                       !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                !- Barometric Pressure {Pa}
    4.8,                    !- Wind Speed {m/s}
    210,                    !- Wind Direction {deg}
    No,                     !- Rain Indicator
    No,                     !- Snow Indicator
    No,                     !- Daylight Saving Time Indicator
    ASHRAETau,              !- Solar Model Indicator
    ,                       !- Beam Solar Day Schedule Name
    ,                       !- Diffuse Solar Day Schedule Name
    0.546,                  !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                  !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg .4% Condns Enth=>MDB,    !- Name
    8,                      !- Month
    21,                     !- Day of Month
    SummerDesignDay,        !- Day Type
    30.6,                   !- Maximum Dry-Bulb Temperature {C}
    7.7,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Enthalpy,               !- Humidity Condition Type
    ,                       !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
```

```
    ,                        !- Humidity Condition Day Schedule Name
    ,                        !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    84800.0,                 !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                        !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                 !- Barometric Pressure {Pa}
    4.8,                     !- Wind Speed {m/s}
    210,                     !- Wind Direction {deg}
    No,                      !- Rain Indicator
    No,                      !- Snow Indicator
    No,                      !- Daylight Saving Time Indicator
    ASHRAETau,               !- Solar Model Indicator
    ,                        !- Beam Solar Day Schedule Name
    ,                        !- Diffuse Solar Day Schedule Name
    0.546,                   !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                   !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 1% Condns Enth=>MDB,    !- Name
    8,                       !- Month
    21,                      !- Day of Month
    SummerDesignDay,         !- Day Type
    29.6,                    !- Maximum Dry-Bulb Temperature {C}
    7.7,                     !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,      !- Dry-Bulb Temperature Range Modifier Type
    ,                        !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Enthalpy,                !- Humidity Condition Type
    ,                        !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                        !- Humidity Condition Day Schedule Name
    ,                        !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    81400.0,                 !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                        !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                 !- Barometric Pressure {Pa}
    4.8,                     !- Wind Speed {m/s}
    210,                     !- Wind Direction {deg}
    No,                      !- Rain Indicator
    No,                      !- Snow Indicator
    No,                      !- Daylight Saving Time Indicator
    ASHRAETau,               !- Solar Model Indicator
    ,                        !- Beam Solar Day Schedule Name
    ,                        !- Diffuse Solar Day Schedule Name
    0.546,                   !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
```

```
    1.827;                  !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

SizingPeriod:DesignDay,
    TOKYO HYAKURI Ann Clg 2% Condns Enth=>MDB,    !- Name
    8,                      !- Month
    21,                     !- Day of Month
    SummerDesignDay,        !- Day Type
    28.6,                   !- Maximum Dry-Bulb Temperature {C}
    7.7,                    !- Daily Dry-Bulb Temperature Range {deltaC}
    DefaultMultipliers,     !- Dry-Bulb Temperature Range Modifier Type
    ,                       !- Dry-Bulb Temperature Range Modifier Day Schedule Name
    Enthalpy,               !- Humidity Condition Type
    ,                       !- Wetbulb or DewPoint at Maximum Dry-Bulb {C}
    ,                       !- Humidity Condition Day Schedule Name
    ,                       !- Humidity Ratio at Maximum Dry-Bulb {kgWater/kgDryAir}
    78400.0,                !- Enthalpy at Maximum Dry-Bulb {J/kg}
    ,                       !- Daily Wet-Bulb Temperature Range {deltaC}
    100905.,                !- Barometric Pressure {Pa}
    4.8,                    !- Wind Speed {m/s}
    210,                    !- Wind Direction {deg}
    No,                     !- Rain Indicator
    No,                     !- Snow Indicator
    No,                     !- Daylight Saving Time Indicator
    ASHRAETau,              !- Solar Model Indicator
    ,                       !- Beam Solar Day Schedule Name
    ,                       !- Diffuse Solar Day Schedule Name
    0.546,                  !- ASHRAE Clear Sky Optical Depth for Beam Irradiance (taub)
{dimensionless}
    1.827;                  !- ASHRAE Clear Sky Optical Depth for Diffuse Irradiance
(taud) {dimensionless}

RunPeriod,
    Run Period 9to10,       !- Name
    9,                      !- Begin Month
    1,                      !- Begin Day of Month
    10,                     !- End Month
    12,                     !- End Day of Month
    Saturday,               !- Day of Week for Start Day
    No,                     !- Use Weather File Holidays and Special Days
    No,                     !- Use Weather File Daylight Saving Period
    No,                     !- Apply Weekend Holiday Rule
    Yes,                    !- Use Weather File Rain Indicators
    Yes,                    !- Use Weather File Snow Indicators
    1,                      !- Number of Times Runperiod to be Repeated
```

```
    Yes,                    !- Increment Day of Week on repeat
    2018;                   !- Start Year

ScheduleTypeLimits,
    Temperature,            !- Name
    -60,                    !- Lower Limit Value
    200,                    !- Upper Limit Value
    Continuous,             !- Numeric Type
    Dimensionless;          !- Unit Type

ScheduleTypeLimits,
    ActivityLevel 13,       !- Name
    0,                      !- Lower Limit Value
    ,                       !- Upper Limit Value
    Continuous,             !- Numeric Type
    activitylevel;          !- Unit Type

ScheduleTypeLimits,
    Control Type,           !- Name
    0,                      !- Lower Limit Value
    4,                      !- Upper Limit Value
    Discrete,               !- Numeric Type
    Dimensionless;          !- Unit Type

Schedule:Day:Hourly,
    Blind Daily,            !- Name
    Control Type,           !- Schedule Type Limits Name
    0,                      !- Hour 1
    0,                      !- Hour 2
    1,                      !- Hour 3
    1,                      !- Hour 4
    1,                      !- Hour 5
    1,                      !- Hour 6
    1,                      !- Hour 7
    1,                      !- Hour 8
    1,                      !- Hour 9
    1,                      !- Hour 10
    1,                      !- Hour 11
    1,                      !- Hour 12
    1,                      !- Hour 13
    1,                      !- Hour 14
    0,                      !- Hour 15
    0,                      !- Hour 16
```

```
    0,                          !- Hour 17
    0,                          !- Hour 18
    0,                          !- Hour 19
    0,                          !- Hour 20
    0,                          !- Hour 21
    0,                          !- Hour 22
    0,                          !- Hour 23
    0;                          !- Hour 24

Schedule:Day:Interval,
    Medium Office Infil Quarter On Default Schedule,    !- Name
    Fraction,                   !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    07:00,                      !- Time 1 {hh:mm}
    1,                          !- Value Until Time 1
    22:00,                      !- Time 2 {hh:mm}
    0.25,                       !- Value Until Time 2
    24:00,                      !- Time 3 {hh:mm}
    1;                          !- Value Until Time 3

Schedule:Day:Interval,
    Medium Office Infil Quarter On Rule 1 Day Schedule,    !- Name
    Fraction,                   !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    24:00,                      !- Time 1 {hh:mm}
    1;                          !- Value Until Time 1

Schedule:Day:Interval,
    Medium Office Infil Quarter On Rule 2 Day Schedule,    !- Name
    Fraction,                   !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    06:00,                      !- Time 1 {hh:mm}
    1,                          !- Value Until Time 1
    18:00,                      !- Time 2 {hh:mm}
    0.25,                       !- Value Until Time 2
    24:00,                      !- Time 3 {hh:mm}
    1;                          !- Value Until Time 3

Schedule:Day:Interval,
    Medium Office Infil Quarter On Summer Design Day,    !- Name
    Fraction,                   !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    06:00,                      !- Time 1 {hh:mm}
```

```
    1,                          !- Value Until Time 1
    18:00,                      !- Time 2 {hh:mm}
    0.25,                       !- Value Until Time 2
    24:00,                      !- Time 3 {hh:mm}
    1;                          !- Value Until Time 3

Schedule:Day:Interval,
    Medium Office Infil Quarter On Winter Design Day,    !- Name
    Fraction,                   !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    06:00,                      !- Time 1 {hh:mm}
    1,                          !- Value Until Time 1
    18:00,                      !- Time 2 {hh:mm}
    0.25,                       !- Value Until Time 2
    24:00,                      !- Time 3 {hh:mm}
    1;                          !- Value Until Time 3

Schedule:Day:Interval,
    Medium Office ClgSetp Default Schedule,    !- Name
    Temperature,                !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    07:00,                      !- Time 1 {hh:mm}
    27,                         !- Value Until Time 1
    19:00,                      !- Time 2 {hh:mm}
    25,                         !- Value Until Time 2
    24:00,                      !- Time 3 {hh:mm}
    27;                         !- Value Until Time 3

Schedule:Day:Interval,
    Medium Office ClgSetp Rule 1 Day Schedule,    !- Name
    Temperature,                !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    24:00,                      !- Time 1 {hh:mm}
    27;                         !- Value Until Time 1

Schedule:Day:Interval,
    Medium Office HtgSetp Default Schedule,    !- Name
    Temperature,                !- Schedule Type Limits Name
    No,                         !- Interpolate to Timestep
    07:00,                      !- Time 1 {hh:mm}
    27,                         !- Value Until Time 1
    19:00,                      !- Time 2 {hh:mm}
    22,                         !- Value Until Time 2
```

```
    24:00,                    !- Time 3 {hh:mm}
    27;                       !- Value Until Time 3

Schedule:Day:Interval,
    Medium Office Bldg Occ Rule 1 Day Schedule,    !- Name
    Fraction,                 !- Schedule Type Limits Name
    No,                       !- Interpolate to Timestep
    24:00,                    !- Time 1 {hh:mm}
    27;                       !- Value Until Time 1

Schedule:Day:Interval,
    Medium Office Activity Default Schedule,    !- Name
    ActivityLevel 13,         !- Schedule Type Limits Name
    No,                       !- Interpolate to Timestep
    24:00,                    !- Time 1 {hh:mm}
    117;                      !- Value Until Time 1

Schedule:Day:Interval,
    Medium Office Activity Summer Design Day,    !- Name
    ActivityLevel 13,         !- Schedule Type Limits Name
    No,                       !- Interpolate to Timestep
    24:00,                    !- Time 1 {hh:mm}
    117;                      !- Value Until Time 1

Schedule:Day:Interval,
    Medium Office Activity Winter Design Day,    !- Name
    ActivityLevel 13,         !- Schedule Type Limits Name
    No,                       !- Interpolate to Timestep
    24:00,                    !- Time 1 {hh:mm}
    117;                      !- Value Until Time 1

Schedule:Week:Daily,
    Blind Weekly,             !- Name
    Blind Daily,              !- Sunday Schedule:Day Name
    Blind Daily,              !- Monday Schedule:Day Name
    Blind Daily,              !- Tuesday Schedule:Day Name
    Blind Daily,              !- Wednesday Schedule:Day Name
    Blind Daily,              !- Thursday Schedule:Day Name
    Blind Daily,              !- Friday Schedule:Day Name
    Blind Daily,              !- Saturday Schedule:Day Name
    Blind Daily,              !- Holiday Schedule:Day Name
    Blind Daily,              !- SummerDesignDay Schedule:Day Name
    Blind Daily,              !- WinterDesignDay Schedule:Day Name
```

Blind Daily, *!- CustomDay1 Schedule:Day Name*
Blind Daily; *!- CustomDay2 Schedule:Day Name*

Schedule:Week:Daily,
VAV Control All Weeks, *!- Name*
VAV Control, *!- Sunday Schedule:Day Name*
VAV Control, *!- Monday Schedule:Day Name*
VAV Control, *!- Tuesday Schedule:Day Name*
VAV Control, *!- Wednesday Schedule:Day Name*
VAV Control, *!- Thursday Schedule:Day Name*
VAV Control, *!- Friday Schedule:Day Name*
VAV Control, *!- Saturday Schedule:Day Name*
VAV Control, *!- Holiday Schedule:Day Name*
VAV Control, *!- SummerDesignDay Schedule:Day Name*
VAV Control, *!- WinterDesignDay Schedule:Day Name*
VAV Control, *!- CustomDay1 Schedule:Day Name*
VAV Control; *!- CustomDay2 Schedule:Day Name*

Schedule:Week:Daily,
Control Type All Weeks, *!- Name*
Control Type All Days, *!- Sunday Schedule:Day Name*
Control Type All Days, *!- Monday Schedule:Day Name*
Control Type All Days, *!- Tuesday Schedule:Day Name*
Control Type All Days, *!- Wednesday Schedule:Day Name*
Control Type All Days, *!- Thursday Schedule:Day Name*
Control Type All Days, *!- Friday Schedule:Day Name*
Control Type All Days, *!- Saturday Schedule:Day Name*
Control Type All Days, *!- Holiday Schedule:Day Name*
Control Type All Days, *!- SummerDesignDay Schedule:Day Name*
Control Type All Days, *!- WinterDesignDay Schedule:Day Name*
Control Type All Days, *!- CustomDay1 Schedule:Day Name*
Control Type All Days; *!- CustomDay2 Schedule:Day Name*

Schedule:Week:Daily,
Schedule:Week:Daily {55a4f610-b4a6-4dcf-8ccf-cf8ded3bdfc9}, *!- Name*
Medium Office Bldg Occ Rule 1 Day Schedule, *!- Sunday Schedule:Day Name*
Medium Office HtgSetp Default Schedule, *!- Monday Schedule:Day Name*
Medium Office HtgSetp Default Schedule, *!- Tuesday Schedule:Day Name*
Medium Office HtgSetp Default Schedule, *!- Wednesday Schedule:Day Name*
Medium Office HtgSetp Default Schedule, *!- Thursday Schedule:Day Name*
Medium Office HtgSetp Default Schedule, *!- Friday Schedule:Day Name*
Medium Office Bldg Occ Rule 1 Day Schedule, *!- Saturday Schedule:Day Name*
Medium Office Bldg Occ Rule 1 Day Schedule, *!- Holiday Schedule:Day Name*

Medium Office HtgSetp Default Schedule, !- SummerDesignDay Schedule:Day Name
Medium Office HtgSetp Default Schedule, !- WinterDesignDay Schedule:Day Name
Medium Office HtgSetp Default Schedule, !- CustomDay1 Schedule:Day Name
Medium Office HtgSetp Default Schedule; !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
Schedule:Week:Daily {091a2c09-207e-4f1e-9f05-4c8cedc0a2dd}, !- Name
Medium Office Activity Default Schedule, !- Sunday Schedule:Day Name
Medium Office Activity Default Schedule, !- Monday Schedule:Day Name
Medium Office Activity Default Schedule, !- Tuesday Schedule:Day Name
Medium Office Activity Default Schedule, !- Wednesday Schedule:Day Name
Medium Office Activity Default Schedule, !- Thursday Schedule:Day Name
Medium Office Activity Default Schedule, !- Friday Schedule:Day Name
Medium Office Activity Default Schedule, !- Saturday Schedule:Day Name
Medium Office Activity Default Schedule, !- Holiday Schedule:Day Name
Medium Office Activity Summer Design Day, !- SummerDesignDay Schedule:Day Name
Medium Office Activity Winter Design Day, !- WinterDesignDay Schedule:Day Name
Medium Office Activity Default Schedule, !- CustomDay1 Schedule:Day Name
Medium Office Activity Default Schedule; !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
Off - 24 Hours, !- Name
Off - 24 Hours, !- Sunday Schedule:Day Name
Off - 24 Hours, !- Monday Schedule:Day Name
Off - 24 Hours, !- Tuesday Schedule:Day Name
Off - 24 Hours, !- Wednesday Schedule:Day Name
Off - 24 Hours, !- Thursday Schedule:Day Name
Off - 24 Hours, !- Friday Schedule:Day Name
Off - 24 Hours, !- Saturday Schedule:Day Name
Off - 24 Hours, !- Holiday Schedule:Day Name
Off - 24 Hours, !- SummerDesignDay Schedule:Day Name
Off - 24 Hours, !- WinterDesignDay Schedule:Day Name
Off - 24 Hours, !- CustomDay1 Schedule:Day Name
Off - 24 Hours; !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
Schedule:Week:Daily {0d7b3cbe-9bb4-49d0-a04d-de5508c80c6f}, !- Name
Medium Office Infil Quarter On Default Schedule, !- Sunday Schedule:Day Name
Medium Office Infil Quarter On Default Schedule, !- Monday Schedule:Day Name
Medium Office Infil Quarter On Default Schedule, !- Tuesday Schedule:Day Name
Medium Office Infil Quarter On Default Schedule, !- Wednesday Schedule:Day Name
Medium Office Infil Quarter On Default Schedule, !- Thursday Schedule:Day Name
Medium Office Infil Quarter On Default Schedule, !- Friday Schedule:Day Name

Medium Office Infil Quarter On Rule 2 Day Schedule, !- Saturday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Holiday Schedule:Day Name

Medium Office Infil Quarter On Summer Design Day, !- SummerDesignDay Schedule:Day Name

Medium Office Infil Quarter On Winter Design Day, !- WinterDesignDay Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- CustomDay1 Schedule:Day Name

Medium Office Infil Quarter On Default Schedule; !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,

Schedule:Week:Daily {b9dbd79d-648f-4e9a-8be3-6e2ada8ec4a1}, !- Name

Medium Office Infil Quarter On Rule 1 Day Schedule, !- Sunday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Monday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Tuesday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Wednesday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Thursday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Friday Schedule:Day Name

Medium Office Infil Quarter On Rule 2 Day Schedule, !- Saturday Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- Holiday Schedule:Day Name

Medium Office Infil Quarter On Summer Design Day, !- SummerDesignDay Schedule:Day Name

Medium Office Infil Quarter On Winter Design Day, !- WinterDesignDay Schedule:Day Name

Medium Office Infil Quarter On Default Schedule, !- CustomDay1 Schedule:Day Name

Medium Office Infil Quarter On Default Schedule; !- CustomDay2 Schedule:Day Name

Schedule:Day:Interval,

Off - 24 Hours, !- Name

Fraction, !- Schedule Type Limits Name

No, !- Interpolate to Timestep

01:00, !- Time 1 {hh:mm}

0, !- Value Until Time 1

02:00, !- Time 2 {hh:mm}

0, !- Value Until Time 2

03:00, !- Time 3 {hh:mm}

0, !- Value Until Time 3

04:00, !- Time 4 {hh:mm}

0, !- Value Until Time 4

05:00, !- Time 5 {hh:mm}

0, !- Value Until Time 5

06:00, !- Time 6 {hh:mm}

0, !- Value Until Time 6

07:00, !- Time 7 {hh:mm}

0, !- Value Until Time 7

08:00, !- Time 8 {hh:mm}

```
    0,                      !- Value Until Time 8
    09:00,                  !- Time 9 {hh:mm}
    0,                      !- Value Until Time 9
    10:00,                  !- Time 10 {hh:mm}
    0,                      !- Value Until Time 10
    11:00,                  !- Time 11 {hh:mm}
    0,                      !- Value Until Time 11
    12:00,                  !- Time 12 {hh:mm}
    0,                      !- Value Until Time 12
    13:00,                  !- Time 13 {hh:mm}
    0,                      !- Value Until Time 13
    14:00,                  !- Time 14 {hh:mm}
    0.996,                  !- Value Until Time 14
    15:00,                  !- Time 15 {hh:mm}
    0,                      !- Value Until Time 15
    16:00,                  !- Time 16 {hh:mm}
    0,                      !- Value Until Time 16
    17:00,                  !- Time 17 {hh:mm}
    0,                      !- Value Until Time 17
    18:00,                  !- Time 18 {hh:mm}
    0,                      !- Value Until Time 18
    19:00,                  !- Time 19 {hh:mm}
    0,                      !- Value Until Time 19
    20:00,                  !- Time 20 {hh:mm}
    0,                      !- Value Until Time 20
    21:00,                  !- Time 21 {hh:mm}
    0,                      !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0,                      !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0,                      !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0;                      !- Value Until Time 24

Schedule:Year,
    Blind,                  !- Name
    Control Type,           !- Schedule Type Limits Name
    Blind Weekly,           !- Schedule:Week Name 1
    1,                      !- Start Month 1
    1,                      !- Start Day 1
    12,                     !- End Month 1
    31;                     !- End Day 1
```

Schedule:Year,
VAV Control, !- Name
Any Number, !- Schedule Type Limits Name
VAV Control All Weeks, !- Schedule:Week Name 1
1, !- Start Month 1
1, !- Start Day 1
12, !- End Month 1
31; !- End Day 1

Schedule:Year,
Medium Office Infil Quarter On, !- Name
Fraction, !- Schedule Type Limits Name
Schedule:Week:Daily {0d7b3cbe-9bb4-49d0-a04d-de5508c80c6f}, !- Schedule:Week Name 1
1, !- Start Month 1
1, !- Start Day 1
1, !- End Month 1
6, !- End Day 1
Schedule:Week:Daily {b9dbd79d-648f-4e9a-8be3-6e2ada8ec4a1}, !- Schedule:Week Name 2
1, !- Start Month 2
7, !- Start Day 2
12, !- End Month 2
31; !- End Day 2

ScheduleTypeLimits,
Any Number; !- Name

Schedule:Year,
Zone Control Type Sched, !- Name
Control Type, !- Schedule Type Limits Name
Control Type All Weeks, !- Schedule:Week Name 1
1, !- Start Month 1
1, !- Start Day 1
12, !- End Month 1
31; !- End Day 1

Schedule:Year,
Medium Office ClgSetp, !- Name
Temperature, !- Schedule Type Limits Name
Schedule:Week:Daily {a563f476-0467-438c-b2d6-56fd52dfe64a}, !- Schedule:Week Name 1
1, !- Start Month 1
1, !- Start Day 1
12, !- End Month 1

```
    31;                         !- End Day 1

Schedule:Year,
    Medium Office HtgSetp,      !- Name
    Temperature,                !- Schedule Type Limits Name
    Schedule:Week:Daily {55a4f610-b4a6-4dcf-8ccf-cf8ded3bdfc9},    !- Schedule:Week Name 1
    1,                          !- Start Month 1
    1,                          !- Start Day 1
    12,                         !- End Month 1
    31;                         !- End Day 1

Schedule:Year,
    Medium Office Activity,     !- Name
    ActivityLevel 13,           !- Schedule Type Limits Name
    Schedule:Week:Daily {091a2c09-207e-4f1e-9f05-4c8cedc0a2dd},    !- Schedule:Week Name 1
    1,                          !- Start Month 1
    1,                          !- Start Day 1
    12,                         !- End Month 1
    31;                         !- End Day 1

Schedule:Year,
    Off - 24 Hours,             !- Name
    Fraction,                   !- Schedule Type Limits Name
    Off - 24 Hours,             !- Schedule:Week Name 1
    1,                          !- Start Month 1
    1,                          !- Start Day 1
    12,                         !- End Month 1
    31;                         !- End Day 1

Material,
    JP_Wall: 200 [mm],          !- Name
    MediumRough,                !- Roughness
    0.2,                        !- Thickness {m}
    0.0001,                     !- Conductivity {W/m-K}
    12,                         !- Density {kg/m3}
    840,                        !- Specific Heat {J/kg-K}
    0.9,                        !- Thermal Absorptance
    0.7,                        !- Solar Absorptance
    0.7;                        !- Visible Absorptance

Material,
    G01a 19mm gypsum board,     !- Name
    MediumSmooth,               !- Roughness
```

```
    0.019,                    !- Thickness {m}
    0.16,                     !- Conductivity {W/m-K}
    800,                      !- Density {kg/m3}
    1090;                     !- Specific Heat {J/kg-K}

Material:AirGap,
    F04 Wall air space resistance,    !- Name
    0.15;                     !- Thermal Resistance {m2-K/W}

WindowMaterial:Blind,
    BLIND WITH HIGH REFLECTIVITY SLATS,    !- Name
    Horizontal,               !- Slat Orientation
    0.025,                    !- Slat Width {m}
    0.01875,                  !- Slat Separation {m}
    0.001,                    !- Slat Thickness {m}
    45.0,                     !- Slat Angle {deg}
    0.9,                      !- Slat Conductivity {W/m-K}
    0.0,                      !- Slat Beam Solar Transmittance
    0.8,                      !- Front Side Slat Beam Solar Reflectance
    0.8,                      !- Back Side Slat Beam Solar Reflectance
    0.0,                      !- Slat Diffuse Solar Transmittance
    0.8,                      !- Front Side Slat Diffuse Solar Reflectance
    0.8,                      !- Back Side Slat Diffuse Solar Reflectance
    0.0,                      !- Slat Beam Visible Transmittance
    0.8,                      !- Front Side Slat Beam Visible Reflectance
    0.8,                      !- Back Side Slat Beam Visible Reflectance
    0.0,                      !- Slat Diffuse Visible Transmittance
    0.8,                      !- Front Side Slat Diffuse Visible Reflectance
    0.8,                      !- Back Side Slat Diffuse Visible Reflectance
    0.0,                      !- Slat Infrared Hemispherical Transmittance
    0.9,                      !- Front Side Slat Infrared Hemispherical Emissivity
    0.9,                      !- Back Side Slat Infrared Hemispherical Emissivity
    0.050,                    !- Blind to Glass Distance {m}
    0.5,                      !- Blind Top Opening Multiplier
    0.5,                      !- Blind Bottom Opening Multiplier
    0.5,                      !- Blind Left Side Opening Multiplier
    0.5,                      !- Blind Right Side Opening Multiplier
    ,                         !- Minimum Slat Angle {deg}
    ;                         !- Maximum Slat Angle {deg}

Construction,
    Medium Partitions,        !- Name
    G01a 19mm gypsum board,   !- Outside Layer
```

```
    F04 Wall air space resistance,    !- Layer 2
    G01a 19mm gypsum board;    !- Layer 3

ZoneList,
    1,                          !- Name
    1I,                         !- Zone 1 Name
    1P;                         !- Zone 2 Name

ZoneList,
    2,                          !- Name
    2I,                         !- Zone 1 Name
    2P;                         !- Zone 2 Name

ZoneList,
    All,                        !- Name
    1I,                         !- Zone 1 Name
    1P,                         !- Zone 2 Name
    2I,                         !- Zone 3 Name
    2P;                         !- Zone 4 Name

WindowProperty:ShadingControl,
    Shading Control 1,          !- Name
    InteriorBlind,              !- Shading Type
    ,                           !- Construction with Shading Name
    OnIfScheduleAllows,         !- Shading Control Type
    Blind,                      !- Schedule Name
    ,                           !- Setpoint {W/m2, W or deg C}
    Yes,                        !- Shading Control Is Scheduled
    No,                         !- Glare Control Is Active
    BLIND WITH HIGH REFLECTIVITY SLATS,    !- Shading Device Material Name
    FixedSlatAngle,             !- Type of Slat Angle Control for Blinds
    ;                           !- Slat Angle Schedule Name

InternalMass,
    JP_Furniture1I,             !- Name
    Medium Partitions,          !- Construction Name
    1I,                         !- Zone Name
    200;                        !- Surface Area {m2}

InternalMass,
    JP_Furniture2I,             !- Name
    Medium Partitions,          !- Construction Name
    2I,                         !- Zone Name
```

```
    200;                        !- Surface Area {m2}

People,
    people-2I,                  !- Name
    2I,                         !- Zone or ZoneList Name
    JP_Occ2,                    !- Number of People Schedule Name
    Area/Person,                !- Number of People Calculation Method
    ,                           !- Number of People
    ,                           !- People per Zone Floor Area {person/m2}
    7.34,                       !- Zone Floor Area per Person {m2/person}
    0.3,                        !- Fraction Radiant
    autocalculate,              !- Sensible Heat Fraction
    Medium Office Activity;     !- Activity Level Schedule Name

People,
    people-1I,                  !- Name
    1I,                         !- Zone or ZoneList Name
    JP_Occ1,                    !- Number of People Schedule Name
    Area/Person,                !- Number of People Calculation Method
    ,                           !- Number of People
    ,                           !- People per Zone Floor Area {person/m2}
    7.32,                       !- Zone Floor Area per Person {m2/person}
    0.3,                        !- Fraction Radiant
    autocalculate,              !- Sensible Heat Fraction
    Medium Office Activity;     !- Activity Level Schedule Name

People,
    people-1P,                  !- Name
    1P,                         !- Zone or ZoneList Name
    JP_OccP,                    !- Number of People Schedule Name
    Area/Person,                !- Number of People Calculation Method
    ,                           !- Number of People
    ,                           !- People per Zone Floor Area {person/m2}
    3.8,                        !- Zone Floor Area per Person {m2/person}
    0.3,                        !- Fraction Radiant
    autocalculate,              !- Sensible Heat Fraction
    Medium Office Activity;     !- Activity Level Schedule Name

People,
    people-2P,                  !- Name
    2P,                         !- Zone or ZoneList Name
    JP_OccP,                    !- Number of People Schedule Name
    Area/Person,                !- Number of People Calculation Method
```

```
    ,                         !- Number of People
    ,                         !- People per Zone Floor Area {person/m2}
    7.75,                     !- Zone Floor Area per Person {m2/person}
    0.3,                      !- Fraction Radiant
    autocalculate,            !- Sensible Heat Fraction
    Medium Office Activity;   !- Activity Level Schedule Name

Lights,
    lights-aim0064,           !- Name
    1,                        !- Zone or ZoneList Name
    JP_Light1,                !- Schedule Name
    Watts/Area,               !- Design Level Calculation Method
    ,                         !- Lighting Level {W}
    4.59,                     !- Watts per Zone Floor Area {W/m2}
    ,                         !- Watts per Person {W/person}
    0.0,                      !- Return Air Fraction
    0.35,                     !- Fraction Radiant
    0.25,                     !- Fraction Visible
    0.0,                      !- Fraction Replaceable
    GeneralLights;            !- End-Use Subcategory

Lights,
    lights-aim0622,           !- Name
    2,                        !- Zone or ZoneList Name
    JP_Light2,                !- Schedule Name
    Watts/Area,               !- Design Level Calculation Method
    ,                         !- Lighting Level {W}
    4.97,                     !- Watts per Zone Floor Area {W/m2}
    ,                         !- Watts per Person {W/person}
    0.0,                      !- Return Air Fraction
    0.35,                     !- Fraction Radiant
    0.25,                     !- Fraction Visible
    0.0,                      !- Fraction Replaceable
    GeneralLights;            !- End-Use Subcategory

ElectricEquipment,
    electrical-aim0064,       !- Name
    1I,                       !- Zone or ZoneList Name
    JP_Equ1,                  !- Schedule Name
    Watts/Area,               !- Design Level Calculation Method
    ,                         !- Design Level {W}
    5,                        !- Watts per Zone Floor Area {W/m2}
    ,                         !- Watts per Person {W/person}
```

```
    0.0,                    !- Fraction Latent
    0.3,                    !- Fraction Radiant
    0.0,                    !- Fraction Lost
    0;                      !- End-Use Subcategory

ElectricEquipment,
    electrical-aim0622,     !- Name
    2I,                     !- Zone or ZoneList Name
    JP_Equ2,                !- Schedule Name
    Watts/Area,             !- Design Level Calculation Method
    ,                       !- Design Level {W}
    7,                      !- Watts per Zone Floor Area {W/m2}
    ,                       !- Watts per Person {W/person}
    0.0,                    !- Fraction Latent
    0.3,                    !- Fraction Radiant
    0.0,                    !- Fraction Lost
    0;                      !- End-Use Subcategory

ZoneInfiltration:DesignFlowRate,
    AirLeakage,             !- Name
    All,                    !- Zone or ZoneList Name
    Medium Office Infil Quarter On,    !- Schedule Name
    AirChanges/Hour,        !- Design Flow Rate Calculation Method
    ,                       !- Design Flow Rate {m3/s}
    ,                       !- Flow per Zone Floor Area {m3/s-m2}
    ,                       !- Flow per Exterior Surface Area {m3/s-m2}
    0.076,                  !- Air Changes per Hour {1/hr}
    ,                       !- Constant Term Coefficient
    ,                       !- Temperature Term Coefficient
    ,                       !- Velocity Term Coefficient
    ;                       !- Velocity Squared Term Coefficient

HVACTemplate:Thermostat,
    All Zones,              !- Name
    Medium Office HtgSetp,  !- Heating Setpoint Schedule Name
    ,                       !- Constant Heating Setpoint {C}
    Medium Office ClgSetp,  !- Cooling Setpoint Schedule Name
    ;                       !- Constant Cooling Setpoint {C}

HVACTemplate:Zone:VAV,
    1I,                     !- Zone Name
    VAV Sys 1I,             !- Template VAV System Name
    All Zones,              !- Template Thermostat Name
```

```
    autosize,                !- Supply Air Maximum Flow Rate {m3/s}
    ,                        !- Zone Heating Sizing Factor
    ,                        !- Zone Cooling Sizing Factor
    Constant,                !- Zone Minimum Air Flow Input Method
    0.3,                     !- Constant Minimum Air Flow Fraction
    ,                        !- Fixed Minimum Air Flow Rate {m3/s}
    ,                        !- Minimum Air Flow Fraction Schedule Name
    Flow/Person,             !- Outdoor Air Method
    0.0069,                  !- Outdoor Air Flow Rate per Person {m3/s}
    ,                        !- Outdoor Air Flow Rate per Zone Floor Area {m3/s-m2}
    ,                        !- Outdoor Air Flow Rate per Zone {m3/s}
    None,                    !- Reheat Coil Type
    ,                        !- Reheat Coil Availability Schedule Name
    Reverse,                 !- Damper Heating Action
    ,                        !- Maximum Flow per Zone Floor Area During Reheat {m3/s-m2}
    ,                        !- Maximum Flow Fraction During Reheat
    ,                        !- Maximum Reheat Air Temperature {C}
    ,                        !- Design Specification Outdoor Air Object Name for Control
    ,                        !- Supply Plenum Name
    ,                        !- Return Plenum Name
    None,                    !- Baseboard Heating Type
    ,                        !- Baseboard Heating Availability Schedule Name
    autosize,                !- Baseboard Heating Capacity {W}
    SupplyAirTemperature,    !- Zone Cooling Design Supply Air Temperature Input Method
    13,                      !- Zone Cooling Design Supply Air Temperature {C}
    16.6,                    !- Zone Cooling Design Supply Air Temperature Difference {deltaC}
    SupplyAirTemperature,    !- Zone Heating Design Supply Air Temperature Input Method
    50,                      !- Zone Heating Design Supply Air Temperature {C}
    30;                      !- Zone Heating Design Supply Air Temperature Difference {deltaC}

HVACTemplate:Zone:VAV,
    1P,                      !- Zone Name
    VAV Sys 1P,              !- Template VAV System Name
    All Zones,               !- Template Thermostat Name
    autosize,                !- Supply Air Maximum Flow Rate {m3/s}
    ,                        !- Zone Heating Sizing Factor
    ,                        !- Zone Cooling Sizing Factor
    Constant,                !- Zone Minimum Air Flow Input Method
    0.3,                     !- Constant Minimum Air Flow Fraction
    ,                        !- Fixed Minimum Air Flow Rate {m3/s}
    ,                        !- Minimum Air Flow Fraction Schedule Name
    Flow/Person,             !- Outdoor Air Method
```

```
    0.0069,                  !- Outdoor Air Flow Rate per Person {m3/s}
    ,                        !- Outdoor Air Flow Rate per Zone Floor Area {m3/s-m2}
    ,                        !- Outdoor Air Flow Rate per Zone {m3/s}
    None,                    !- Reheat Coil Type
    ,                        !- Reheat Coil Availability Schedule Name
    Reverse,                 !- Damper Heating Action
    ,                        !- Maximum Flow per Zone Floor Area During Reheat {m3/s-
m2}
    ,                        !- Maximum Flow Fraction During Reheat
    ,                        !- Maximum Reheat Air Temperature {C}
    ,                        !- Design Specification Outdoor Air Object Name for Control
    ,                        !- Supply Plenum Name
    ,                        !- Return Plenum Name
    None,                    !- Baseboard Heating Type
    ,                        !- Baseboard Heating Availability Schedule Name
    autosize,                !- Baseboard Heating Capacity {W}
    SystemSupplyAirTemperature,  !- Zone Cooling Design Supply Air Temperature Input Method
    13,                      !- Zone Cooling Design Supply Air Temperature {C}
    12,                      !- Zone Cooling Design Supply Air Temperature Difference
{deltaC}
    SupplyAirTemperature,    !- Zone Heating Design Supply Air Temperature Input Method
    50,                      !- Zone Heating Design Supply Air Temperature {C}
    30;                      !- Zone Heating Design Supply Air Temperature Difference
{deltaC}

HVACTemplate:Zone:VAV,
    2I,                      !- Zone Name
    VAV Sys 2I,              !- Template VAV System Name
    All Zones,               !- Template Thermostat Name
    autosize,                !- Supply Air Maximum Flow Rate {m3/s}
    ,                        !- Zone Heating Sizing Factor
    ,                        !- Zone Cooling Sizing Factor
    Constant,                !- Zone Minimum Air Flow Input Method
    0.3,                     !- Constant Minimum Air Flow Fraction
    ,                        !- Fixed Minimum Air Flow Rate {m3/s}
    ,                        !- Minimum Air Flow Fraction Schedule Name
    Flow/Person,             !- Outdoor Air Method
    0.0069,                  !- Outdoor Air Flow Rate per Person {m3/s}
    ,                        !- Outdoor Air Flow Rate per Zone Floor Area {m3/s-m2}
    ,                        !- Outdoor Air Flow Rate per Zone {m3/s}
    None,                    !- Reheat Coil Type
    ,                        !- Reheat Coil Availability Schedule Name
    Reverse,                 !- Damper Heating Action
    ,                        !- Maximum Flow per Zone Floor Area During Reheat {m3/s-
m2}
```

```
    ,                         !- Maximum Flow Fraction During Reheat
    ,                         !- Maximum Reheat Air Temperature {C}
    ,                         !- Design Specification Outdoor Air Object Name for Control
    ,                         !- Supply Plenum Name
    ,                         !- Return Plenum Name
    None,                     !- Baseboard Heating Type
    ,                         !- Baseboard Heating Availability Schedule Name
    autosize,                 !- Baseboard Heating Capacity {W}
    SystemSupplyAirTemperature,   !- Zone Cooling Design Supply Air Temperature Input Method
    13,                       !- Zone Cooling Design Supply Air Temperature {C}
    15.7,                     !- Zone Cooling Design Supply Air Temperature Difference {deltaC}
    SupplyAirTemperature,     !- Zone Heating Design Supply Air Temperature Input Method
    50,                       !- Zone Heating Design Supply Air Temperature {C}
    30;                       !- Zone Heating Design Supply Air Temperature Difference {deltaC}

HVACTemplate:Zone:VAV,
    2P,                       !- Zone Name
    VAV Sys 2P,               !- Template VAV System Name
    All Zones,                !- Template Thermostat Name
    autosize,                 !- Supply Air Maximum Flow Rate {m3/s}
    ,                         !- Zone Heating Sizing Factor
    ,                         !- Zone Cooling Sizing Factor
    Constant,                 !- Zone Minimum Air Flow Input Method
    0.3,                      !- Constant Minimum Air Flow Fraction
    ,                         !- Fixed Minimum Air Flow Rate {m3/s}
    ,                         !- Minimum Air Flow Fraction Schedule Name
    Flow/Person,              !- Outdoor Air Method
    0.0069,                   !- Outdoor Air Flow Rate per Person {m3/s}
    ,                         !- Outdoor Air Flow Rate per Zone Floor Area {m3/s-m2}
    ,                         !- Outdoor Air Flow Rate per Zone {m3/s}
    None,                     !- Reheat Coil Type
    ,                         !- Reheat Coil Availability Schedule Name
    Reverse,                  !- Damper Heating Action
    ,                         !- Maximum Flow per Zone Floor Area During Reheat {m3/s-m2}
    ,                         !- Maximum Flow Fraction During Reheat
    ,                         !- Maximum Reheat Air Temperature {C}
    ,                         !- Design Specification Outdoor Air Object Name for Control
    ,                         !- Supply Plenum Name
    ,                         !- Return Plenum Name
    None,                     !- Baseboard Heating Type
    ,                         !- Baseboard Heating Availability Schedule Name
    autosize,                 !- Baseboard Heating Capacity {W}
```

```
    SystemSupplyAirTemperature,    !- Zone Cooling Design Supply Air Temperature Input Method
    16.9,                          !- Zone Cooling Design Supply Air Temperature {C}
    7.1,                           !- Zone Cooling Design Supply Air Temperature Difference
{deltaC}
    SupplyAirTemperature,          !- Zone Heating Design Supply Air Temperature Input Method
    50,                            !- Zone Heating Design Supply Air Temperature {C}
    30;                            !- Zone Heating Design Supply Air Temperature Difference
{deltaC}

HVACTemplate:System:VAV,
    VAV Sys 1I,                    !- Name
    VAV Control,                   !- System Availability Schedule Name
    autosize,                      !- Supply Fan Maximum Flow Rate {m3/s}
    autosize,                      !- Supply Fan Minimum Flow Rate {m3/s}
    0.7,                           !- Supply Fan Total Efficiency
    600,                           !- Supply Fan Delta Pressure {Pa}
    0.9,                           !- Supply Fan Motor Efficiency
    1,                             !- Supply Fan Motor in Air Stream Fraction
    ChilledWater,                  !- Cooling Coil Type
    ,                              !- Cooling Coil Availability Schedule Name
    ,                              !- Cooling Coil Setpoint Schedule Name
    13,                            !- Cooling Coil Design Setpoint {C}
    None,                          !- Heating Coil Type
    ,                              !- Heating Coil Availability Schedule Name
    ,                              !- Heating Coil Setpoint Schedule Name
    10.0,                          !- Heating Coil Design Setpoint {C}
    0.8,                           !- Gas Heating Coil Efficiency
    0.0,                           !- Gas Heating Coil Parasitic Electric Load {W}
    None,                          !- Preheat Coil Type
    ,                              !- Preheat Coil Availability Schedule Name
    ,                              !- Preheat Coil Setpoint Schedule Name
    ,                              !- Preheat Coil Design Setpoint {C}
    0.8,                           !- Gas Preheat Coil Efficiency
    0.0,                           !- Gas Preheat Coil Parasitic Electric Load {W}
    autosize,                      !- Maximum Outdoor Air Flow Rate {m3/s}
    autosize,                      !- Minimum Outdoor Air Flow Rate {m3/s}
    FixedMinimum,                  !- Minimum Outdoor Air Control Type
    ,                              !- Minimum Outdoor Air Schedule Name
    NoEconomizer,                  !- Economizer Type
    NoLockout,                     !- Economizer Lockout
    19,                            !- Economizer Upper Temperature Limit {C}
    4,                             !- Economizer Lower Temperature Limit {C}
    ,                              !- Economizer Upper Enthalpy Limit {J/kg}
    ,                              !- Economizer Maximum Limit Dewpoint Temperature {C}
```

```
    ,                         !- Supply Plenum Name
    ,                         !- Return Plenum Name
    DrawThrough,              !- Supply Fan Placement
    VariableSpeedMotor,       !- Supply Fan Part-Load Power Coefficients
    StayOff,                  !- Night Cycle Control
    ,                         !- Night Cycle Control Zone Name
    None,                     !- Heat Recovery Type
    0.70,                     !- Sensible Heat Recovery Effectiveness
    0.65,                     !- Latent Heat Recovery Effectiveness
    None,                     !- Cooling Coil Setpoint Reset Type
    None,                     !- Heating Coil Setpoint Reset Type
    None,                     !- Dehumidification Control Type
    ,                         !- Dehumidification Control Zone Name
    60.0,                     !- Dehumidification Setpoint {percent}
    None,                     !- Humidifier Type
    ,                         !- Humidifier Availability Schedule Name
    0.000001,                 !- Humidifier Rated Capacity {m3/s}
    2690.0,                   !- Humidifier Rated Electric Power {W}
    ,                         !- Humidifier Control Zone Name
    50,                       !- Humidifier Setpoint {percent}
    NonCoincident,            !- Sizing Option
    ,                         !- Return Fan
    ,                         !- Return Fan Total Efficiency
    ,                         !- Return Fan Delta Pressure {Pa}
    ,                         !- Return Fan Motor Efficiency
    ,                         !- Return Fan Motor in Air Stream Fraction
    ;                         !- Return Fan Part-Load Power Coefficients

HVACTemplate:System:VAV,
    VAV Sys 1P,               !- Name
    VAV 1P,                   !- System Availability Schedule Name
    autosize,                 !- Supply Fan Maximum Flow Rate {m3/s}
    autosize,                 !- Supply Fan Minimum Flow Rate {m3/s}
    0.7,                      !- Supply Fan Total Efficiency
    600,                      !- Supply Fan Delta Pressure {Pa}
    0.9,                      !- Supply Fan Motor Efficiency
    1,                        !- Supply Fan Motor in Air Stream Fraction
    ChilledWater,             !- Cooling Coil Type
    ,                         !- Cooling Coil Availability Schedule Name
    ,                         !- Cooling Coil Setpoint Schedule Name
    13,                       !- Cooling Coil Design Setpoint {C}
    None,                     !- Heating Coil Type
    ,                         !- Heating Coil Availability Schedule Name
```

```
,                         !- Heating Coil Setpoint Schedule Name
10.0,                     !- Heating Coil Design Setpoint {C}
0.8,                      !- Gas Heating Coil Efficiency
0.0,                      !- Gas Heating Coil Parasitic Electric Load {W}
None,                     !- Preheat Coil Type
,                         !- Preheat Coil Availability Schedule Name
,                         !- Preheat Coil Setpoint Schedule Name
,                         !- Preheat Coil Design Setpoint {C}
0.8,                      !- Gas Preheat Coil Efficiency
0.0,                      !- Gas Preheat Coil Parasitic Electric Load {W}
autosize,                 !- Maximum Outdoor Air Flow Rate {m3/s}
autosize,                 !- Minimum Outdoor Air Flow Rate {m3/s}
FixedMinimum,             !- Minimum Outdoor Air Control Type
,                         !- Minimum Outdoor Air Schedule Name
NoEconomizer,             !- Economizer Type
NoLockout,                !- Economizer Lockout
19,                       !- Economizer Upper Temperature Limit {C}
4,                        !- Economizer Lower Temperature Limit {C}
,                         !- Economizer Upper Enthalpy Limit {J/kg}
,                         !- Economizer Maximum Limit Dewpoint Temperature {C}
,                         !- Supply Plenum Name
,                         !- Return Plenum Name
DrawThrough,              !- Supply Fan Placement
VariableSpeedMotor,       !- Supply Fan Part-Load Power Coefficients
StayOff,                  !- Night Cycle Control
,                         !- Night Cycle Control Zone Name
None,                     !- Heat Recovery Type
0.70,                     !- Sensible Heat Recovery Effectiveness
0.65,                     !- Latent Heat Recovery Effectiveness
None,                     !- Cooling Coil Setpoint Reset Type
None,                     !- Heating Coil Setpoint Reset Type
None,                     !- Dehumidification Control Type
,                         !- Dehumidification Control Zone Name
60.0,                     !- Dehumidification Setpoint {percent}
None,                     !- Humidifier Type
,                         !- Humidifier Availability Schedule Name
0.000001,                 !- Humidifier Rated Capacity {m3/s}
2690.0,                   !- Humidifier Rated Electric Power {W}
,                         !- Humidifier Control Zone Name
50,                       !- Humidifier Setpoint {percent}
NonCoincident,            !- Sizing Option
,                         !- Return Fan
,                         !- Return Fan Total Efficiency
```

```
    ,                        !- Return Fan Delta Pressure {Pa}
    ,                        !- Return Fan Motor Efficiency
    ,                        !- Return Fan Motor in Air Stream Fraction
    ;                        !- Return Fan Part-Load Power Coefficients

HVACTemplate:System:VAV,
    VAV Sys 2I,              !- Name
    VAV Control,             !- System Availability Schedule Name
    autosize,                !- Supply Fan Maximum Flow Rate {m3/s}
    autosize,                !- Supply Fan Minimum Flow Rate {m3/s}
    0.7,                     !- Supply Fan Total Efficiency
    600,                     !- Supply Fan Delta Pressure {Pa}
    0.9,                     !- Supply Fan Motor Efficiency
    1,                       !- Supply Fan Motor in Air Stream Fraction
    ChilledWater,            !- Cooling Coil Type
    ,                        !- Cooling Coil Availability Schedule Name
    ,                        !- Cooling Coil Setpoint Schedule Name
    13,                      !- Cooling Coil Design Setpoint {C}
    None,                    !- Heating Coil Type
    ,                        !- Heating Coil Availability Schedule Name
    ,                        !- Heating Coil Setpoint Schedule Name
    10.0,                    !- Heating Coil Design Setpoint {C}
    0.8,                     !- Gas Heating Coil Efficiency
    0.0,                     !- Gas Heating Coil Parasitic Electric Load {W}
    None,                    !- Preheat Coil Type
    ,                        !- Preheat Coil Availability Schedule Name
    ,                        !- Preheat Coil Setpoint Schedule Name
    ,                        !- Preheat Coil Design Setpoint {C}
    0.8,                     !- Gas Preheat Coil Efficiency
    0.0,                     !- Gas Preheat Coil Parasitic Electric Load {W}
    autosize,                !- Maximum Outdoor Air Flow Rate {m3/s}
    autosize,                !- Minimum Outdoor Air Flow Rate {m3/s}
    FixedMinimum,            !- Minimum Outdoor Air Control Type
    ,                        !- Minimum Outdoor Air Schedule Name
    NoEconomizer,            !- Economizer Type
    NoLockout,               !- Economizer Lockout
    19,                      !- Economizer Upper Temperature Limit {C}
    4,                       !- Economizer Lower Temperature Limit {C}
    ,                        !- Economizer Upper Enthalpy Limit {J/kg}
    ,                        !- Economizer Maximum Limit Dewpoint Temperature {C}
    ,                        !- Supply Plenum Name
    ,                        !- Return Plenum Name
    DrawThrough,             !- Supply Fan Placement
```

```
    VariableSpeedMotor,      !- Supply Fan Part-Load Power Coefficients
    StayOff,                 !- Night Cycle Control
    ,                        !- Night Cycle Control Zone Name
    None,                    !- Heat Recovery Type
    0.70,                    !- Sensible Heat Recovery Effectiveness
    0.65,                    !- Latent Heat Recovery Effectiveness
    None,                    !- Cooling Coil Setpoint Reset Type
    None,                    !- Heating Coil Setpoint Reset Type
    None,                    !- Dehumidification Control Type
    ,                        !- Dehumidification Control Zone Name
    60.0,                    !- Dehumidification Setpoint {percent}
    None,                    !- Humidifier Type
    ,                        !- Humidifier Availability Schedule Name
    0.000001,                !- Humidifier Rated Capacity {m3/s}
    2690.0,                  !- Humidifier Rated Electric Power {W}
    ,                        !- Humidifier Control Zone Name
    50,                      !- Humidifier Setpoint {percent}
    NonCoincident,           !- Sizing Option
    ,                        !- Return Fan
    ,                        !- Return Fan Total Efficiency
    ,                        !- Return Fan Delta Pressure {Pa}
    ,                        !- Return Fan Motor Efficiency
    ,                        !- Return Fan Motor in Air Stream Fraction
    ;                        !- Return Fan Part-Load Power Coefficients

HVACTemplate:System:VAV,
    VAV Sys 2P,              !- Name
    VAV 2P,                  !- System Availability Schedule Name
    autosize,                !- Supply Fan Maximum Flow Rate {m3/s}
    autosize,                !- Supply Fan Minimum Flow Rate {m3/s}
    0.7,                     !- Supply Fan Total Efficiency
    600,                     !- Supply Fan Delta Pressure {Pa}
    0.9,                     !- Supply Fan Motor Efficiency
    1,                       !- Supply Fan Motor in Air Stream Fraction
    ChilledWater,            !- Cooling Coil Type
    ,                        !- Cooling Coil Availability Schedule Name
    ,                        !- Cooling Coil Setpoint Schedule Name
    13,                      !- Cooling Coil Design Setpoint {C}
    None,                    !- Heating Coil Type
    ,                        !- Heating Coil Availability Schedule Name
    ,                        !- Heating Coil Setpoint Schedule Name
    10.0,                    !- Heating Coil Design Setpoint {C}
    0.8,                     !- Gas Heating Coil Efficiency
```

0.0, *!- Gas Heating Coil Parasitic Electric Load {W}*
None, *!- Preheat Coil Type*
, *!- Preheat Coil Availability Schedule Name*
, *!- Preheat Coil Setpoint Schedule Name*
, *!- Preheat Coil Design Setpoint {C}*
0.8, *!- Gas Preheat Coil Efficiency*
0.0, *!- Gas Preheat Coil Parasitic Electric Load {W}*
autosize, *!- Maximum Outdoor Air Flow Rate {m3/s}*
autosize, *!- Minimum Outdoor Air Flow Rate {m3/s}*
FixedMinimum, *!- Minimum Outdoor Air Control Type*
, *!- Minimum Outdoor Air Schedule Name*
NoEconomizer, *!- Economizer Type*
NoLockout, *!- Economizer Lockout*
19, *!- Economizer Upper Temperature Limit {C}*
4, *!- Economizer Lower Temperature Limit {C}*
, *!- Economizer Upper Enthalpy Limit {J/kg}*
, *!- Economizer Maximum Limit Dewpoint Temperature {C}*
, *!- Supply Plenum Name*
, *!- Return Plenum Name*
DrawThrough, *!- Supply Fan Placement*
VariableSpeedMotor, *!- Supply Fan Part-Load Power Coefficients*
StayOff, *!- Night Cycle Control*
, *!- Night Cycle Control Zone Name*
None, *!- Heat Recovery Type*
0.70, *!- Sensible Heat Recovery Effectiveness*
0.65, *!- Latent Heat Recovery Effectiveness*
None, *!- Cooling Coil Setpoint Reset Type*
None, *!- Heating Coil Setpoint Reset Type*
None, *!- Dehumidification Control Type*
, *!- Dehumidification Control Zone Name*
60.0, *!- Dehumidification Setpoint {percent}*
None, *!- Humidifier Type*
, *!- Humidifier Availability Schedule Name*
0.000001, *!- Humidifier Rated Capacity {m3/s}*
2690.0, *!- Humidifier Rated Electric Power {W}*
, *!- Humidifier Control Zone Name*
50, *!- Humidifier Setpoint {percent}*
NonCoincident, *!- Sizing Option*
, *!- Return Fan*
, *!- Return Fan Total Efficiency*
, *!- Return Fan Delta Pressure {Pa}*
, *!- Return Fan Motor Efficiency*
, *!- Return Fan Motor in Air Stream Fraction*

```
    ;                           !- Return Fan Part-Load Power Coefficients

HVACTemplate:Plant:ChilledWaterLoop,
    Chilled Water Loop,         !- Name
    ,                           !- Pump Schedule Name
    INTERMITTENT,               !- Pump Control Type
    Default,                    !- Chiller Plant Operation Scheme Type
    ,                           !- Chiller Plant Equipment Operation Schemes Name
    ,                           !- Chilled Water Setpoint Schedule Name
    7.22,                       !- Chilled Water Design Setpoint {C}
    ConstantPrimaryNoSecondary, !- Chilled Water Pump Configuration
    179352,                     !- Primary Chilled Water Pump Rated Head {Pa}
    179352,                     !- Secondary Chilled Water Pump Rated Head {Pa}
    Default,                    !- Condenser Plant Operation Scheme Type
    ,                           !- Condenser Equipment Operation Schemes Name
    ,                           !- Condenser Water Temperature Control Type
    ,                           !- Condenser Water Setpoint Schedule Name
    29.4,                       !- Condenser Water Design Setpoint {C}
    179352,                     !- Condenser Water Pump Rated Head {Pa}
    None,                       !- Chilled Water Setpoint Reset Type
    12.2,                       !- Chilled Water Setpoint at Outdoor Dry-Bulb Low {C}
    15.6,                       !- Chilled Water Reset Outdoor Dry-Bulb Low {C}
    6.7,                        !- Chilled Water Setpoint at Outdoor Dry-Bulb High {C}
    26.7,                       !- Chilled Water Reset Outdoor Dry-Bulb High {C}
    ,                           !- Chilled Water Primary Pump Type
    ,                           !- Chilled Water Secondary Pump Type
    ,                           !- Condenser Water Pump Type
    ,                           !- Chilled Water Supply Side Bypass Pipe
    ,                           !- Chilled Water Demand Side Bypass Pipe
    ,                           !- Condenser Water Supply Side Bypass Pipe
    ,                           !- Condenser Water Demand Side Bypass Pipe
    ,                           !- Fluid Type
    ,                           !- Loop Design Delta Temperature {deltaC}
    7.22;                       !- Minimum Outdoor Dry Bulb Temperature {C}

HVACTemplate:Plant:Chiller,
    Main Chiller,               !- Name
    ElectricScrewChiller,       !- Chiller Type
    autosize,                   !- Capacity {W}
    4,                          !- Nominal COP {W/W}
    WaterCooled,                !- Condenser Type
    1,                          !- Priority
    ;                           !- Sizing Factor
```

```
HVACTemplate:Plant:Tower,
    Main Tower,                 !- Name
    SingleSpeed,                !- Tower Type
    autosize,                   !- High Speed Nominal Capacity {W}
    autosize,                   !- High Speed Fan Power {W}
    autosize,                   !- Low Speed Nominal Capacity {W}
    autosize,                   !- Low Speed Fan Power {W}
    autosize,                   !- Free Convection Capacity {W}
    1,                          !- Priority
    ;                           !- Sizing Factor

OutputControl:Table:Style,
    HTML,                       !- Column Separator
    JtoKWH;                     !- Unit Conversion

Output:Variable,*,Zone Electric Equipment Electric Power,Hourly;
Output:Variable,*,Air System Fan Electric Energy,Hourly;
Output:Variable,*,Air System Cooling Coil Chilled Water Energy,Hourly;
Output:Variable,*,Zone Air Temperature,Hourly;
Output:Variable,*,Zone Air Relative Humidity,hourly;
Output:Variable,*,Zone People Total Heating Rate,Hourly;
Output:Variable,*,Zone People Total Heating Energy,Hourly;
Output:Variable,*,Zone Lights Total Heating Energy,Hourly;
Output:Variable,*,Zone Lights Total Heating Rate,Hourly;
Output:Variable,*,Zone Electric Equipment Total Heating Energy,Hourly;
Output:Variable,*,Zone Electric Equipment Total Heating Rate,Hourly;

Output:Diagnostics,
    DisplayExtraWarnings;       !- Key 1

InternalMass,
    JP_Furniture1P,             !- Name
    Medium Partitions,          !- Construction Name
    1P,                         !- Zone Name
    20;                         !- Surface Area {m2}

InternalMass,
    JP_Furniture2P,             !- Name
    Medium Partitions,          !- Construction Name
    2P,                         !- Zone Name
    20;                         !- Surface Area {m2}
```

```
Version,8.9;
Timestep,6;

Shading:Building:Detailed,
    X-S-21,                  !- Name
    ,                        !- Transmittance Schedule Name
    ,                        !- Number of Vertices
    -181.6454, 15.21165, 0,          !- X,Y,Z  1 {m}
    -181.6454, 15.21165, 150,        !- X,Y,Z  2 {m}
    -172.963, 64.45203, 150,         !- X,Y,Z  3 {m}
    -172.963, 64.45203, 0;           !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-22,                  !- Name
    ,                        !- Transmittance Schedule Name
    ,                        !- Number of Vertices
    -227.1274, 74.00269, 0,          !- X,Y,Z  1 {m}
    -172.963, 64.45203, 0,           !- X,Y,Z  2 {m}
    -172.963, 64.45203, 150,         !- X,Y,Z  3 {m}
    -227.1274, 74.00269, 150;        !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-23,                  !- Name
    ,                        !- Transmittance Schedule Name
    ,                        !- Number of Vertices
    -235.8098, 24.7623, 0,           !- X,Y,Z  1 {m}
    -227.1274, 74.00269, 0,          !- X,Y,Z  2 {m}
    -227.1274, 74.00269, 150,        !- X,Y,Z  3 {m}
    -235.8098, 24.7623, 150;         !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-24,                  !- Name
    ,                        !- Transmittance Schedule Name
    ,                        !- Number of Vertices
    -235.8098, 24.7623, 0,           !- X,Y,Z  1 {m}
    -235.8098, 24.7623, 150,         !- X,Y,Z  2 {m}
    -181.6454, 15.21165, 150,        !- X,Y,Z  3 {m}
    -181.6454, 15.21165, 0;          !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-25,                  !- Name
    ,                        !- Transmittance Schedule Name
    ,                        !- Number of Vertices
```

```
    -207.7912, -61.27833, 0,                !- X,Y,Z  1 {m}
    -207.7912, -61.27833, 200,              !- X,Y,Z  2 {m}
    -156.5233, -74.71698, 200,              !- X,Y,Z  3 {m}
    -156.5233, -74.71698, 0;                !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-26,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -181.8792, -171.449, 0,             !- X,Y,Z  1 {m}
    -156.5233, -74.71698, 0,            !- X,Y,Z  2 {m}
    -156.5233, -74.71698, 200,          !- X,Y,Z  3 {m}
    -181.8792, -171.449, 200;           !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-27,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -235.694, 24.84341, 3.465175e-013,  !- X,Y,Z  1 {m}
    -181.7265, 15.32749, 3.465175e-013, !- X,Y,Z  2 {m}
    -173.0788, 64.37092, 3.465175e-013, !- X,Y,Z  3 {m}
    -227.0463, 73.88684, 3.465175e-013; !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-28,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -235.694, 24.84341, 150.2,          !- X,Y,Z  1 {m}
    -181.7265, 15.32749, 150.2,         !- X,Y,Z  2 {m}
    -173.0788, 64.37092, 150.2,         !- X,Y,Z  3 {m}
    -227.0463, 73.88684, 150.2;         !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-29,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -233.0251, -157.9389, 200.2,        !- X,Y,Z  1 {m}
    -181.9506, -171.3269, 200.2,        !- X,Y,Z  2 {m}
    -156.6454, -74.78835, 200.2,        !- X,Y,Z  3 {m}
    -207.7198, -61.40041, 200.2;        !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-30,                 !- Name
```

```
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -137.0022, -123.6236, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -102.5339, -129.7013, 3.465175e-013,
                                                !- X,Y,Z  2 {m}
    -102.5339, -129.7013, 140,          !- X,Y,Z  3 {m}
    -137.0022, -123.6236, 140;          !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-31,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -147.4211, -182.7121, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -147.4211, -182.7121, 140,          !- X,Y,Z  2 {m}
    -137.0022, -123.6236, 140,          !- X,Y,Z  3 {m}
    -137.0022, -123.6236, 3.465175e-013;
                                                !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-32,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -47.64967, -30.27214, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -1, -36, 3.465175e-013,             !- X,Y,Z  2 {m}
    -1, -36, 100,                        !- X,Y,Z  3 {m}
    -47.64967, -30.27214, 100;          !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-33,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -76.80607, -53.05162, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -76.80607, -53.05162, 100,          !- X,Y,Z  2 {m}
    -47.64967, -30.27214, 100,          !- X,Y,Z  3 {m}
    -47.64967, -30.27214, 3.465175e-013;
                                                !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-34,                     !- Name
```

```
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -82.53393, -99.70129, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -76.80607, -53.05162, 3.465175e-013,
                                                !- X,Y,Z  2 {m}
    -76.80607, -53.05162, 100,          !- X,Y,Z  3 {m}
    -82.53393, -99.70129, 100;          !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-35,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -9.916321, -108.6176, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -1, -36, 3.465175e-013,             !- X,Y,Z  2 {m}
    -1, -36, 100,                        !- X,Y,Z  3 {m}
    -9.916321, -108.6176, 100;          !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-36,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -82.53393, -99.70129, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -82.53393, -99.70129, 100,          !- X,Y,Z  2 {m}
    -9.916321, -108.6176, 100,          !- X,Y,Z  3 {m}
    -9.916321, -108.6176, 3.465175e-013;
                                                !- X,Y,Z  4 {m}

Shading:Building:Detailed,
    X-S-37,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -82.42249, -99.61422, 3.465175e-013,
                                                !- X,Y,Z  1 {m}
    -10.00339, -108.5062, 3.465175e-013,
                                                !- X,Y,Z  2 {m}
    -1.111441, -36.08707, 3.465175e-013,
                                                !- X,Y,Z  3 {m}
    -47.62074, -30.37644, 3.465175e-013,
                                                !- X,Y,Z  4 {m}
    -76.71186, -53.10492, 3.465175e-013;
```

```
                                        !- X,Y,Z   5 {m}

Shading:Building:Detailed,
    X-S-38,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -82.42249, -99.61422, 100.2,        !- X,Y,Z   1 {m}
    -10.00339, -108.5062, 100.2,        !- X,Y,Z   2 {m}
    -1.111441, -36.08707, 100.2,        !- X,Y,Z   3 {m}
    -47.62074, -30.37644, 100.2,        !- X,Y,Z   4 {m}
    -76.71186, -53.10492, 100.2;        !- X,Y,Z   5 {m}

Shading:Building:Detailed,
    X-S-39,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -112.9528, -188.7897, 3.465175e-013,
                                        !- X,Y,Z   1 {m}
    -102.5339, -129.7013, 3.465175e-013,
                                        !- X,Y,Z   2 {m}
    -102.5339, -129.7013, 140,          !- X,Y,Z   3 {m}
    -112.9528, -188.7897, 140;          !- X,Y,Z   4 {m}

Shading:Building:Detailed,
    X-S-40,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -147.4211, -182.7121, 3.465175e-013,
                                        !- X,Y,Z   1 {m}
    -147.4211, -182.7121, 140,          !- X,Y,Z   2 {m}
    -112.9528, -188.7897, 140,          !- X,Y,Z   3 {m}
    -112.9528, -188.7897, 3.465175e-013;
                                        !- X,Y,Z   4 {m}

Shading:Building:Detailed,
    X-S-41,                 !- Name
    ,                       !- Transmittance Schedule Name
    ,                       !- Number of Vertices
    -233.1472, -158.0103, 3.465175e-013,
                                        !- X,Y,Z   1 {m}
    -207.7912, -61.27833, 3.528651e-013,
                                        !- X,Y,Z   2 {m}
    -207.7912, -61.27833, 200,          !- X,Y,Z   3 {m}
```

```
    -233.1472, -158.0103, 200;              !- X,Y,Z    4 {m}

Shading:Building:Detailed,
    X-S-42,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -233.1472, -158.0103, 3.465175e-013,
                                                !- X,Y,Z    1 {m}
    -181.8792, -171.449, 3.528651e-013, !- X,Y,Z    2 {m}
    -181.8792, -171.449, 200,               !- X,Y,Z    3 {m}
    -233.1472, -158.0103, 200;              !- X,Y,Z    4 {m}

Shading:Building:Detailed,
    X-S-43,                     !- Name
    ,                           !- Transmittance Schedule Name
    ,                           !- Number of Vertices
    -233.0251, -157.9389, 3.465175e-013,
                                                !- X,Y,Z    1 {m}
    -181.9506, -171.3269, 3.465175e-013,
                                                !- X,Y,Z    2 {m}
    -156.6454, -74.78835, 3.465175e-013,
                                                !- X,Y,Z    3 {m}
    -207.7198, -61.40041, 3.465175e-013;
                                                !- X,Y,Z    4 {m}

Zone,
    1I;                         !- Name

BuildingSurface:Detailed,
    B-1-E-F-4,                  !- Name
    Floor,                      !- Surface Type
    Floor: JP_Floor,            !- Construction Name
    1I,                         !- Zone Name
    Ground,                     !- Outside Boundary Condition
    ,                           !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
    NoWind,                     !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -22.86196, 5.829625, 78.85,             !- X,Y,Z    1 {m}
    -20.95714, 21.34312, 78.85,             !- X,Y,Z    2 {m}
    2.270426, 18.49113, 78.85,              !- X,Y,Z    3 {m}
    0.365608, 2.977638, 78.85;              !- X,Y,Z    4 {m}
```

```
BuildingSurface:Detailed,
    E-1-E-W-1,                !- Name
    Wall,                     !- Surface Type
    Basic Wall: JP Wall,      !- Construction Name
    1I,                       !- Zone Name
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    0.365608, 2.977638, 78.85,          !- X,Y,Z  1 {m}
    2.270426, 18.49113, 78.85,          !- X,Y,Z  2 {m}
    2.270426, 18.49113, 83.2,           !- X,Y,Z  3 {m}
    0.365608, 2.977638, 83.2;           !- X,Y,Z  4 {m}

FenestrationSurface:Detailed,
    E-1-E-W-1-W-1,            !- Name
    Window,                   !- Surface Type
    Low-E triple glazing SC=0.3,  !- Construction Name
    E-1-E-W-1,                !- Building Surface Name
    ,                         !- Outside Boundary Condition Object
    ,                         !- View Factor to Ground
    Shading Control 1,        !- Shading Control Name
    ,                         !- Frame and Divider Name
    ,                         !- Multiplier
    ,                         !- Number of Vertices
    0.365608, 2.977638, 78.95,          !- X,Y,Z  1 {m}
    1.469135, 11.96514, 78.95,          !- X,Y,Z  2 {m}
    1.469135, 11.96514, 82.98,          !- X,Y,Z  3 {m}
    0.365608, 2.977638, 82.98;          !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    N-1-E-W-2,                !- Name
    Wall,                     !- Surface Type
    Basic Wall: JP Wall,      !- Construction Name
    1I,                       !- Zone Name
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
```

```
    ,                                   !- Number of Vertices
    -20.95714, 21.34312, 78.85,         !- X,Y,Z  1 {m}
    -20.95714, 21.34312, 83.2,          !- X,Y,Z  2 {m}
    2.270426, 18.49113, 83.2,           !- X,Y,Z  3 {m}
    2.270426, 18.49113, 78.85;          !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    S-1-3-I-W-5,                !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP_Air,         !- Construction Name
    1I,                         !- Zone Name
    Surface,                    !- Outside Boundary Condition
    S-1-3-I-W-5 Reversed,       !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
    NoWind,                     !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -22.86196, 5.829625, 78.85,         !- X,Y,Z  1 {m}
    0.365608, 2.977638, 78.85,          !- X,Y,Z  2 {m}
    0.365608, 2.977638, 83.2,           !- X,Y,Z  3 {m}
    -22.86196, 5.829625, 83.2;          !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    T-1-E-R-3,                  !- Name
    Roof,                       !- Surface Type
    Basic Roof: Roof,           !- Construction Name
    1I,                         !- Zone Name
    Outdoors,                   !- Outside Boundary Condition
    ,                           !- Outside Boundary Condition Object
    SunExposed,                 !- Sun Exposure
    WindExposed,                !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -22.86196, 5.829625, 83.2,          !- X,Y,Z  1 {m}
    0.365608, 2.977638, 83.2,           !- X,Y,Z  2 {m}
    2.270426, 18.49113, 83.2,           !- X,Y,Z  3 {m}
    -20.95714, 21.34312, 83.2;          !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    W-1-4-I-W-6,                !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP_Air,         !- Construction Name
    1I,                         !- Zone Name
```

```
    Surface,                  !- Outside Boundary Condition
    W-1-4-I-W-6 Reversed,     !- Outside Boundary Condition Object
    NoSun,                    !- Sun Exposure
    NoWind,                   !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -22.86196, 5.829625, 78.85,          !- X,Y,Z  1 {m}
    -22.86196, 5.829625, 83.2,           !- X,Y,Z  2 {m}
    -20.95714, 21.34312, 83.2,           !- X,Y,Z  3 {m}
    -20.95714, 21.34312, 78.85;          !- X,Y,Z  4 {m}

Zone,
    1P;                       !- Name

BuildingSurface:Detailed,
    B-3-E-F-10,               !- Name
    Floor,                    !- Surface Type
    Floor: JP_Floor,          !- Construction Name
    1P,                       !- Zone Name
    Ground,                   !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    NoSun,                    !- Sun Exposure
    NoWind,                   !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -23.22757, 2.851986, 78.85,          !- X,Y,Z  1 {m}
    -22.86196, 5.829625, 78.85,          !- X,Y,Z  2 {m}
    0.365608, 2.977638, 78.85,           !- X,Y,Z  3 {m}
    -9.204371e-015, -4.899974e-014, 78.85;
                                         !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    E-3-E-W-8,                !- Name
    Wall,                     !- Surface Type
    Basic Wall: JP Wall,      !- Construction Name
    1P,                       !- Zone Name
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    8.121504e-015, -3.492246e-014, 78.85,
```

```
                                        !- X,Y,Z   1 {m}
    0.365608, 2.977638, 78.85,          !- X,Y,Z   2 {m}
    0.365608, 2.977638, 83.2,           !- X,Y,Z   3 {m}
    8.121504e-015, -3.492246e-014, 83.2;
                                        !- X,Y,Z   4 {m}

FenestrationSurface:Detailed,
    E-3-E-W-8-W-1,              !- Name
    Window,                     !- Surface Type
    Low-E triple glazing SC=0.3,    !- Construction Name
    E-3-E-W-8,                  !- Building Surface Name
    ,                           !- Outside Boundary Condition Object
    ,                           !- View Factor to Ground
    Shading Control 1,          !- Shading Control Name
    ,                           !- Frame and Divider Name
    ,                           !- Multiplier
    ,                           !- Number of Vertices
    0.0182804, 0.1488819, 78.95,        !- X,Y,Z   1 {m}
    0.365608, 2.977638, 78.95,          !- X,Y,Z   2 {m}
    0.365608, 2.977638, 82.98,          !- X,Y,Z   3 {m}
    0.0182804, 0.1488819, 82.98;        !- X,Y,Z   4 {m}

BuildingSurface:Detailed,
    S-1-3-I-W-5 Reversed,       !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP_Air,         !- Construction Name
    1P,                         !- Zone Name
    Surface,                    !- Outside Boundary Condition
    S-1-3-I-W-5,                !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
    NoWind,                     !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -22.86196, 5.829625, 83.2,          !- X,Y,Z   1 {m}
    0.365608, 2.977638, 83.2,           !- X,Y,Z   2 {m}
    0.365608, 2.977638, 78.85,          !- X,Y,Z   3 {m}
    -22.86196, 5.829625, 78.85;         !- X,Y,Z   4 {m}

BuildingSurface:Detailed,
    S-3-E-W-7,                  !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP Wall,        !- Construction Name
    1P,                         !- Zone Name
```

```
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -23.22757, 2.851986, 78.85,          !- X,Y,Z  1 {m}
    8.121504e-015, -5.116547e-014, 78.85,
                                         !- X,Y,Z  2 {m}
    -9.204371e-015, -4.899974e-014, 83.2,
                                         !- X,Y,Z  3 {m}
    -23.22757, 2.851986, 83.2;           !- X,Y,Z  4 {m}

FenestrationSurface:Detailed,
    S-3-E-W-7-W-1,            !- Name
    Window,                   !- Surface Type
    Low-E triple glazing SC=0.3,   !- Construction Name
    S-3-E-W-7,                !- Building Surface Name
    ,                         !- Outside Boundary Condition Object
    ,                         !- View Factor to Ground
    Shading Control 1,        !- Shading Control Name
    ,                         !- Frame and Divider Name
    ,                         !- Multiplier
    ,                         !- Number of Vertices
    -23.22757, 2.851986, 78.95,          !- X,Y,Z  1 {m}
    -0.1488819, 0.0182804, 78.95,        !- X,Y,Z  2 {m}
    -0.1488819, 0.0182804, 82.98,        !- X,Y,Z  3 {m}
    -23.22757, 2.851986, 82.98;          !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    T-3-E-R-9,                !- Name
    Roof,                     !- Surface Type
    Basic Roof: Roof,         !- Construction Name
    1P,                       !- Zone Name
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -23.22757, 2.851986, 83.2,           !- X,Y,Z  1 {m}
    8.121504e-015, -3.492246e-014, 83.2,
                                         !- X,Y,Z  2 {m}
```

```
    0.365608, 2.977638, 83.2,               !- X,Y,Z  3 {m}
    -22.86196, 5.829625, 83.2;              !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    W-3-5-I-W-11,               !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP_Air,         !- Construction Name
    1P,                         !- Zone Name
    Surface,                    !- Outside Boundary Condition
    W-3-5-I-W-11 Reversed,      !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
    NoWind,                     !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -23.22757, 2.851986, 78.85,             !- X,Y,Z  1 {m}
    -23.22757, 2.851986, 83.2,              !- X,Y,Z  2 {m}
    -22.86196, 5.829625, 83.2,              !- X,Y,Z  3 {m}
    -22.86196, 5.829625, 78.85;             !- X,Y,Z  4 {m}

Zone,
    2I;                         !- Name

BuildingSurface:Detailed,
    B-4-E-F-15,                 !- Name
    Floor,                      !- Surface Type
    Floor: JP_Floor,            !- Construction Name
    2I,                         !- Zone Name
    Ground,                     !- Outside Boundary Condition
    ,                           !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
    NoWind,                     !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -44.38126, 8.471863, 78.85,             !- X,Y,Z  1 {m}
    -42.47644, 23.98536, 78.85,             !- X,Y,Z  2 {m}
    -20.95714, 21.34312, 78.85,             !- X,Y,Z  3 {m}
    -22.86196, 5.829625, 78.85;             !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    N-4-E-W-13,                 !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP Wall,        !- Construction Name
    2I,                         !- Zone Name
```

```
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -42.47644, 23.98536, 78.85,       !- X,Y,Z  1 {m}
    -42.47644, 23.98536, 83.2,        !- X,Y,Z  2 {m}
    -20.95714, 21.34312, 83.2,        !- X,Y,Z  3 {m}
    -20.95714, 21.34312, 78.85;       !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    S-4-5-I-W-16,             !- Name
    Wall,                     !- Surface Type
    Basic Wall: JP_Air,       !- Construction Name
    2I,                       !- Zone Name
    Surface,                  !- Outside Boundary Condition
    S-4-5-I-W-16 Reversed,    !- Outside Boundary Condition Object
    NoSun,                    !- Sun Exposure
    NoWind,                   !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -44.38126, 8.471863, 78.85,       !- X,Y,Z  1 {m}
    -22.86196, 5.829625, 78.85,       !- X,Y,Z  2 {m}
    -22.86196, 5.829625, 83.2,        !- X,Y,Z  3 {m}
    -44.38126, 8.471863, 83.2;        !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    T-4-E-R-14,               !- Name
    Roof,                     !- Surface Type
    Basic Roof: Roof,         !- Construction Name
    2I,                       !- Zone Name
    Outdoors,                 !- Outside Boundary Condition
    ,                         !- Outside Boundary Condition Object
    SunExposed,               !- Sun Exposure
    WindExposed,              !- Wind Exposure
    ,                         !- View Factor to Ground
    ,                         !- Number of Vertices
    -44.38126, 8.471863, 83.2,        !- X,Y,Z  1 {m}
    -22.86196, 5.829625, 83.2,        !- X,Y,Z  2 {m}
    -20.95714, 21.34312, 83.2,        !- X,Y,Z  3 {m}
    -42.47644, 23.98536, 83.2;        !- X,Y,Z  4 {m}
```

```
BuildingSurface:Detailed,
    W-1-4-I-W-6 Reversed,       !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP_Air,         !- Construction Name
    2I,                         !- Zone Name
    Surface,                    !- Outside Boundary Condition
    W-1-4-I-W-6,                !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
    NoWind,                     !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -20.95714, 21.34312, 78.85,         !- X,Y,Z  1 {m}
    -20.95714, 21.34312, 83.2,          !- X,Y,Z  2 {m}
    -22.86196, 5.829625, 83.2,          !- X,Y,Z  3 {m}
    -22.86196, 5.829625, 78.85;         !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    W-4-E-W-12,                 !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP Wall,        !- Construction Name
    2I,                         !- Zone Name
    Outdoors,                   !- Outside Boundary Condition
    ,                           !- Outside Boundary Condition Object
    SunExposed,                 !- Sun Exposure
    WindExposed,                !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -44.38126, 8.471863, 78.85,         !- X,Y,Z  1 {m}
    -44.38126, 8.471863, 83.2,          !- X,Y,Z  2 {m}
    -42.47644, 23.98536, 83.2,          !- X,Y,Z  3 {m}
    -42.47644, 23.98536, 78.85;         !- X,Y,Z  4 {m}

Zone,
    2P;                         !- Name

BuildingSurface:Detailed,
    B-5-E-F-20,                 !- Name
    Floor,                      !- Surface Type
    Floor: JP_Floor,            !- Construction Name
    2P,                         !- Zone Name
    Ground,                     !- Outside Boundary Condition
    ,                           !- Outside Boundary Condition Object
    NoSun,                      !- Sun Exposure
```

```
    NoWind,                  !- Wind Exposure
    ,                        !- View Factor to Ground
    ,                        !- Number of Vertices
    -44.74687, 5.494225, 78.85,      !- X,Y,Z  1 {m}
    -44.38126, 8.471863, 78.85,      !- X,Y,Z  2 {m}
    -22.86196, 5.829625, 78.85,      !- X,Y,Z  3 {m}
    -23.22757, 2.851986, 78.85;      !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    S-4-5-I-W-16 Reversed,   !- Name
    Wall,                    !- Surface Type
    Basic Wall: JP_Air,      !- Construction Name
    2P,                      !- Zone Name
    Surface,                 !- Outside Boundary Condition
    S-4-5-I-W-16,            !- Outside Boundary Condition Object
    NoSun,                   !- Sun Exposure
    NoWind,                  !- Wind Exposure
    ,                        !- View Factor to Ground
    ,                        !- Number of Vertices
    -44.38126, 8.471863, 83.2,       !- X,Y,Z  1 {m}
    -22.86196, 5.829625, 83.2,       !- X,Y,Z  2 {m}
    -22.86196, 5.829625, 78.85,      !- X,Y,Z  3 {m}
    -44.38126, 8.471863, 78.85;      !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    S-5-E-W-17,              !- Name
    Wall,                    !- Surface Type
    Basic Wall: JP Wall,     !- Construction Name
    2P,                      !- Zone Name
    Outdoors,                !- Outside Boundary Condition
    ,                        !- Outside Boundary Condition Object
    SunExposed,              !- Sun Exposure
    WindExposed,             !- Wind Exposure
    ,                        !- View Factor to Ground
    ,                        !- Number of Vertices
    -44.74687, 5.494225, 78.85,      !- X,Y,Z  1 {m}
    -23.22757, 2.851986, 78.85,      !- X,Y,Z  2 {m}
    -23.22757, 2.851986, 83.2,       !- X,Y,Z  3 {m}
    -44.74687, 5.494225, 83.2;       !- X,Y,Z  4 {m}

FenestrationSurface:Detailed,
    S-5-E-W-17-W-1,          !- Name
    Window,                  !- Surface Type
```

```
    Low-E triple glazing SC=0.3,    !- Construction Name
    S-5-E-W-17,                     !- Building Surface Name
    ,                               !- Outside Boundary Condition Object
    ,                               !- View Factor to Ground
    Shading Control 1,              !- Shading Control Name
    ,                               !- Frame and Divider Name
    ,                               !- Multiplier
    ,                               !- Number of Vertices
    -44.51768, 5.466084, 78.95,             !- X,Y,Z  1 {m}
    -23.22757, 2.851986, 78.95,             !- X,Y,Z  2 {m}
    -23.22757, 2.851986, 82.98,             !- X,Y,Z  3 {m}
    -44.51768, 5.466084, 82.98;             !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    T-5-E-R-19,                     !- Name
    Roof,                           !- Surface Type
    Basic Roof: Roof,               !- Construction Name
    2P,                             !- Zone Name
    Outdoors,                       !- Outside Boundary Condition
    ,                               !- Outside Boundary Condition Object
    SunExposed,                     !- Sun Exposure
    WindExposed,                    !- Wind Exposure
    ,                               !- View Factor to Ground
    ,                               !- Number of Vertices
    -44.74687, 5.494225, 83.2,              !- X,Y,Z  1 {m}
    -23.22757, 2.851986, 83.2,              !- X,Y,Z  2 {m}
    -22.86196, 5.829625, 83.2,              !- X,Y,Z  3 {m}
    -44.38126, 8.471863, 83.2;              !- X,Y,Z  4 {m}

BuildingSurface:Detailed,
    W-3-5-I-W-11 Reversed,      !- Name
    Wall,                           !- Surface Type
    Basic Wall: JP_Air,         !- Construction Name
    2P,                             !- Zone Name
    Surface,                        !- Outside Boundary Condition
    W-3-5-I-W-11,                   !- Outside Boundary Condition Object
    NoSun,                          !- Sun Exposure
    NoWind,                         !- Wind Exposure
    ,                               !- View Factor to Ground
    ,                               !- Number of Vertices
    -22.86196, 5.829625, 78.85,             !- X,Y,Z  1 {m}
    -22.86196, 5.829625, 83.2,              !- X,Y,Z  2 {m}
    -23.22757, 2.851986, 83.2,              !- X,Y,Z  3 {m}
```

```
    -23.22757, 2.851986, 78.85;              !- X,Y,Z    4 {m}

BuildingSurface:Detailed,
    W-5-E-W-18,                 !- Name
    Wall,                       !- Surface Type
    Basic Wall: JP Wall,        !- Construction Name
    2P,                         !- Zone Name
    Outdoors,                   !- Outside Boundary Condition
    ,                           !- Outside Boundary Condition Object
    SunExposed,                 !- Sun Exposure
    WindExposed,                !- Wind Exposure
    ,                           !- View Factor to Ground
    ,                           !- Number of Vertices
    -44.74687, 5.494225, 78.85,             !- X,Y,Z    1 {m}
    -44.74687, 5.494225, 83.2,              !- X,Y,Z    2 {m}
    -44.38126, 8.471863, 83.2,              !- X,Y,Z    3 {m}
    -44.38126, 8.471863, 78.85;             !- X,Y,Z    4 {m}

HeatBalanceAlgorithm,ConductionTransferFunction,200;

ShadowCalculation,
    AverageOverDaysInFrequency,    !- Calculation Method
    20,                            !- Calculation Frequency
    15000;                         !- Maximum Figures in Shadow Overlap Calculations

Sizing:Parameters,
    1.25,                       !- Heating Sizing Factor
    1.15;                       !- Cooling Sizing Factor

GlobalGeometryRules,
    UpperLeftCorner,            !- Starting Vertex Position
    Counterclockwise,           !- Vertex Entry Direction
    Relative,                   !- Coordinate System
    Relative,                   !- Daylighting Reference Point Coordinate System
    Relative;                   !- Rectangular Surface Coordinate System

Material,
    Air: 10 [mm],               !- Name
    MediumRough,                  !- Roughness
    0.01,                       !- Thickness {m}
    0.025,                      !- Conductivity {W/m-K}
    1.2,                        !- Density {kg/m3}
    1003.5,                     !- Specific Heat {J/kg-K}
```

```
    0.9,                    !- Thermal Absorptance
    0.7,                    !- Solar Absorptance
    0.7;                    !- Visible Absorptance

Construction,
    Basic Roof: Roof,       !- Name
    JP_Wall: 200 [mm];      !- Outside Layer

Construction,
    Basic Wall: JP Wall,    !- Name
    JP_Wall: 200 [mm];      !- Outside Layer

Construction,
    Basic Wall: JP_Air,     !- Name
    Air: 10 [mm];           !- Outside Layer

Construction,
    Floor: JP_Floor,        !- Name
    JP_Wall: 200 [mm];      !- Outside Layer

Construction,
    Low-E triple glazing SC=0.3,    !- Name
    {80b6c737-a4c9-4631-aea7-88a7a92b5b96};    !- Outside Layer

ScheduleTypeLimits,
    Fraction,               !- Name
    ,                       !- Lower Limit Value
    ,                       !- Upper Limit Value
    ,                       !- Numeric Type
    dimensionless;          !- Unit Type

Schedule:Day:Interval,
    JP_Light1,              !- Name
    Fraction,               !- Schedule Type Limits Name
    No,                     !- Interpolate to Timestep
    01:00,                  !- Time 1 {hh:mm}
    0,                      !- Value Until Time 1
    02:00,                  !- Time 2 {hh:mm}
    0,                      !- Value Until Time 2
    03:00,                  !- Time 3 {hh:mm}
    0,                      !- Value Until Time 3
    04:00,                  !- Time 4 {hh:mm}
    0,                      !- Value Until Time 4
```

```
    05:00,                  !- Time 5 {hh:mm}
    0,                      !- Value Until Time 5
    06:00,                  !- Time 6 {hh:mm}
    0,                      !- Value Until Time 6
    07:00,                  !- Time 7 {hh:mm}
    0,                      !- Value Until Time 7
    08:00,                  !- Time 8 {hh:mm}
    0,                      !- Value Until Time 8
    09:00,                  !- Time 9 {hh:mm}
    0,                      !- Value Until Time 9
    10:00,                  !- Time 10 {hh:mm}
    0.503,                  !- Value Until Time 10
    11:00,                  !- Time 11 {hh:mm}
    0.503,                  !- Value Until Time 11
    12:00,                  !- Time 12 {hh:mm}
    1,                      !- Value Until Time 12
    13:00,                  !- Time 13 {hh:mm}
    0,                      !- Value Until Time 13
    14:00,                  !- Time 14 {hh:mm}
    0.503,                  !- Value Until Time 14
    15:00,                  !- Time 15 {hh:mm}
    1,                      !- Value Until Time 15
    16:00,                  !- Time 16 {hh:mm}
    0.503,                  !- Value Until Time 16
    17:00,                  !- Time 17 {hh:mm}
    0.503,                  !- Value Until Time 17
    18:00,                  !- Time 18 {hh:mm}
    1,                      !- Value Until Time 18
    19:00,                  !- Time 19 {hh:mm}
    0.503,                  !- Value Until Time 19
    20:00,                  !- Time 20 {hh:mm}
    1,                      !- Value Until Time 20
    21:00,                  !- Time 21 {hh:mm}
    0.503,                  !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0.503,                  !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0.502,                  !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0;                      !- Value Until Time 24

Schedule:Day:Interval,
    JP_Light2,              !- Name
```

```
Fraction,                 !- Schedule Type Limits Name
No,                        !- Interpolate to Timestep
01:00,                    !- Time 1 {hh:mm}
0,                         !- Value Until Time 1
02:00,                    !- Time 2 {hh:mm}
0,                         !- Value Until Time 2
03:00,                    !- Time 3 {hh:mm}
0,                         !- Value Until Time 3
04:00,                    !- Time 4 {hh:mm}
0,                         !- Value Until Time 4
05:00,                    !- Time 5 {hh:mm}
0,                         !- Value Until Time 5
06:00,                    !- Time 6 {hh:mm}
0,                         !- Value Until Time 6
07:00,                    !- Time 7 {hh:mm}
0,                         !- Value Until Time 7
08:00,                    !- Time 8 {hh:mm}
0,                         !- Value Until Time 8
09:00,                    !- Time 9 {hh:mm}
0,                         !- Value Until Time 9
10:00,                    !- Time 10 {hh:mm}
0.503,                    !- Value Until Time 10
11:00,                    !- Time 11 {hh:mm}
0.503,                    !- Value Until Time 11
12:00,                    !- Time 12 {hh:mm}
0.503,                    !- Value Until Time 12
13:00,                    !- Time 13 {hh:mm}
0,                         !- Value Until Time 13
14:00,                    !- Time 14 {hh:mm}
0.503,                    !- Value Until Time 14
15:00,                    !- Time 15 {hh:mm}
1,                         !- Value Until Time 15
16:00,                    !- Time 16 {hh:mm}
0.503,                    !- Value Until Time 16
17:00,                    !- Time 17 {hh:mm}
0.503,                    !- Value Until Time 17
18:00,                    !- Time 18 {hh:mm}
0.503,                    !- Value Until Time 18
19:00,                    !- Time 19 {hh:mm}
0.503,                    !- Value Until Time 19
20:00,                    !- Time 20 {hh:mm}
0.503,                    !- Value Until Time 20
21:00,                    !- Time 21 {hh:mm}
```

```
    0.503,                  !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0.503,                  !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0,                      !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0.502;                  !- Value Until Time 24

Schedule:Day:Interval,
    JP_OccP,                !- Name
    Fraction,               !- Schedule Type Limits Name
    No,                     !- Interpolate to Timestep
    01:00,                  !- Time 1 {hh:mm}
    0,                      !- Value Until Time 1
    02:00,                  !- Time 2 {hh:mm}
    0,                      !- Value Until Time 2
    03:00,                  !- Time 3 {hh:mm}
    0,                      !- Value Until Time 3
    04:00,                  !- Time 4 {hh:mm}
    0,                      !- Value Until Time 4
    05:00,                  !- Time 5 {hh:mm}
    0,                      !- Value Until Time 5
    06:00,                  !- Time 6 {hh:mm}
    0,                      !- Value Until Time 6
    07:00,                  !- Time 7 {hh:mm}
    0,                      !- Value Until Time 7
    08:00,                  !- Time 8 {hh:mm}
    0,                      !- Value Until Time 8
    09:00,                  !- Time 9 {hh:mm}
    0,                      !- Value Until Time 9
    10:00,                  !- Time 10 {hh:mm}
    0,                      !- Value Until Time 10
    11:00,                  !- Time 11 {hh:mm}
    0.1,                    !- Value Until Time 11
    12:00,                  !- Time 12 {hh:mm}
    0,                      !- Value Until Time 12
    13:00,                  !- Time 13 {hh:mm}
    0,                      !- Value Until Time 13
    14:00,                  !- Time 14 {hh:mm}
    0,                      !- Value Until Time 14
    15:00,                  !- Time 15 {hh:mm}
    0.3,                    !- Value Until Time 15
    16:00,                  !- Time 16 {hh:mm}
```

```
    0.1,                    !- Value Until Time 16
    17:00,                  !- Time 17 {hh:mm}
    0,                      !- Value Until Time 17
    18:00,                  !- Time 18 {hh:mm}
    0,                      !- Value Until Time 18
    19:00,                  !- Time 19 {hh:mm}
    0,                      !- Value Until Time 19
    20:00,                  !- Time 20 {hh:mm}
    0,                      !- Value Until Time 20
    21:00,                  !- Time 21 {hh:mm}
    0,                      !- Value Until Time 21
    22:00,                  !- Time 22 {hh:mm}
    0,                      !- Value Until Time 22
    23:00,                  !- Time 23 {hh:mm}
    0,                      !- Value Until Time 23
    24:00,                  !- Time 24 {hh:mm}
    0;                      !- Value Until Time 24

Schedule:Week:Daily,
    JP_Equ1,                !- Name
    JP_Equ1,                !- Sunday Schedule:Day Name
    JP_Equ1,                !- Monday Schedule:Day Name
    JP_Equ1,                !- Tuesday Schedule:Day Name
    JP_Equ1,                !- Wednesday Schedule:Day Name
    JP_Equ1,                !- Thursday Schedule:Day Name
    JP_Equ1,                !- Friday Schedule:Day Name
    JP_Equ1,                !- Saturday Schedule:Day Name
    JP_Equ1,                !- Holiday Schedule:Day Name
    JP_Equ1,                !- SummerDesignDay Schedule:Day Name
    JP_Equ1,                !- WinterDesignDay Schedule:Day Name
    JP_Equ1,                !- CustomDay1 Schedule:Day Name
    JP_Equ1;                !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
    JP_Equ2,                !- Name
    JP_Equ2,                !- Sunday Schedule:Day Name
    JP_Equ2,                !- Monday Schedule:Day Name
    JP_Equ2,                !- Tuesday Schedule:Day Name
    JP_Equ2,                !- Wednesday Schedule:Day Name
    JP_Equ2,                !- Thursday Schedule:Day Name
    JP_Equ2,                !- Friday Schedule:Day Name
    JP_Equ2,                !- Saturday Schedule:Day Name
    JP_Equ2,                !- Holiday Schedule:Day Name
```

```
    JP_Equ2,                !- SummerDesignDay Schedule:Day Name
    JP_Equ2,                !- WinterDesignDay Schedule:Day Name
    JP_Equ2,                !- CustomDay1 Schedule:Day Name
    JP_Equ2;                !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
    JP_Light1,              !- Name
    JP_Light1,              !- Sunday Schedule:Day Name
    JP_Light1,              !- Monday Schedule:Day Name
    JP_Light1,              !- Tuesday Schedule:Day Name
    JP_Light1,              !- Wednesday Schedule:Day Name
    JP_Light1,              !- Thursday Schedule:Day Name
    JP_Light1,              !- Friday Schedule:Day Name
    JP_Light1,              !- Saturday Schedule:Day Name
    JP_Light1,              !- Holiday Schedule:Day Name
    JP_Light1,              !- SummerDesignDay Schedule:Day Name
    JP_Light1,              !- WinterDesignDay Schedule:Day Name
    JP_Light1,              !- CustomDay1 Schedule:Day Name
    JP_Light1;              !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
    JP_Light2,              !- Name
    JP_Light2,              !- Sunday Schedule:Day Name
    JP_Light2,              !- Monday Schedule:Day Name
    JP_Light2,              !- Tuesday Schedule:Day Name
    JP_Light2,              !- Wednesday Schedule:Day Name
    JP_Light2,              !- Thursday Schedule:Day Name
    JP_Light2,              !- Friday Schedule:Day Name
    JP_Light2,              !- Saturday Schedule:Day Name
    JP_Light2,              !- Holiday Schedule:Day Name
    JP_Light2,              !- SummerDesignDay Schedule:Day Name
    JP_Light2,              !- WinterDesignDay Schedule:Day Name
    JP_Light2,              !- CustomDay1 Schedule:Day Name
    JP_Light2;              !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
    JP_Occ1,                !- Name
    JP_Occ1,                !- Sunday Schedule:Day Name
    JP_Occ1,                !- Monday Schedule:Day Name
    JP_Occ1,                !- Tuesday Schedule:Day Name
    JP_Occ1,                !- Wednesday Schedule:Day Name
    JP_Occ1,                !- Thursday Schedule:Day Name
    JP_Occ1,                !- Friday Schedule:Day Name
```

```
    JP_Occ1,                  !- Saturday Schedule:Day Name
    JP_Occ1,                  !- Holiday Schedule:Day Name
    JP_Occ1,                  !- SummerDesignDay Schedule:Day Name
    JP_Occ1,                  !- WinterDesignDay Schedule:Day Name
    JP_Occ1,                  !- CustomDay1 Schedule:Day Name
    JP_Occ1;                  !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
    JP_Occ2,                  !- Name
    JP_Occ2,                  !- Sunday Schedule:Day Name
    JP_Occ2,                  !- Monday Schedule:Day Name
    JP_Occ2,                  !- Tuesday Schedule:Day Name
    JP_Occ2,                  !- Wednesday Schedule:Day Name
    JP_Occ2,                  !- Thursday Schedule:Day Name
    JP_Occ2,                  !- Friday Schedule:Day Name
    JP_Occ2,                  !- Saturday Schedule:Day Name
    JP_Occ2,                  !- Holiday Schedule:Day Name
    JP_Occ2,                  !- SummerDesignDay Schedule:Day Name
    JP_Occ2,                  !- WinterDesignDay Schedule:Day Name
    JP_Occ2,                  !- CustomDay1 Schedule:Day Name
    JP_Occ2;                  !- CustomDay2 Schedule:Day Name

Schedule:Week:Daily,
    JP_OccP,                  !- Name
    JP_OccP,                  !- Sunday Schedule:Day Name
    JP_OccP,                  !- Monday Schedule:Day Name
    JP_OccP,                  !- Tuesday Schedule:Day Name
    JP_OccP,                  !- Wednesday Schedule:Day Name
    JP_OccP,                  !- Thursday Schedule:Day Name
    JP_OccP,                  !- Friday Schedule:Day Name
    JP_OccP,                  !- Saturday Schedule:Day Name
    JP_OccP,                  !- Holiday Schedule:Day Name
    JP_OccP,                  !- SummerDesignDay Schedule:Day Name
    JP_OccP,                  !- WinterDesignDay Schedule:Day Name
    JP_OccP,                  !- CustomDay1 Schedule:Day Name
    JP_OccP;                  !- CustomDay2 Schedule:Day Name

Schedule:Year,
    JP_Equ1,                  !- Name
    Fraction,                 !- Schedule Type Limits Name
    JP_Equ1,                  !- Schedule:Week Name 1
    1,                        !- Start Month 1
    1,                        !- Start Day 1
```

```
    12,                     !- End Month 1
    31;                     !- End Day 1

Schedule:Year,
    JP_Equ2,                !- Name
    Fraction,               !- Schedule Type Limits Name
    JP_Equ2,                !- Schedule:Week Name 1
    1,                      !- Start Month 1
    1,                      !- Start Day 1
    12,                     !- End Month 1
    31;                     !- End Day 1

Schedule:Year,
    JP_Light1,              !- Name
    Fraction,               !- Schedule Type Limits Name
    JP_Light1,              !- Schedule:Week Name 1
    1,                      !- Start Month 1
    1,                      !- Start Day 1
    12,                     !- End Month 1
    31;                     !- End Day 1

Schedule:Year,
    JP_Light2,              !- Name
    Fraction,               !- Schedule Type Limits Name
    JP_Light2,              !- Schedule:Week Name 1
    1,                      !- Start Month 1
    1,                      !- Start Day 1
    12,                     !- End Month 1
    31;                     !- End Day 1

Schedule:Year,
    JP_Occ1,                !- Name
    Fraction,               !- Schedule Type Limits Name
    JP_Occ1,                !- Schedule:Week Name 1
    1,                      !- Start Month 1
    1,                      !- Start Day 1
    12,                     !- End Month 1
    31;                     !- End Day 1

Schedule:Year,
    JP_Occ2,                !- Name
    Fraction,               !- Schedule Type Limits Name
    JP_Occ2,                !- Schedule:Week Name 1
```

```
    1,                          !- Start Month 1
    1,                          !- Start Day 1
    12,                         !- End Month 1
    31;                         !- End Day 1

Schedule:Year,
    JP_OccP,                    !- Name
    Fraction,                   !- Schedule Type Limits Name
    JP_OccP,                    !- Schedule:Week Name 1
    1,                          !- Start Month 1
    1,                          !- Start Day 1
    12,                         !- End Month 1
    31;                         !- End Day 1

Schedule:Constant,Always On Discrete,,1;
Schedule:Constant,Always Off Discrete,,0;
Schedule:Constant,Always On Continuous,,1;

OutdoorAir:Node,
    Model Outdoor Air Node;     !- Name

Output:Table:SummaryReports,
    AllSummary;                 !- Report 1 Name

Output:VariableDictionary,IDF,Unsorted;

Output:SQLite,
    SimpleAndTabular;           !- Option Type
```